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Vol. 9 AUGUST, 1928 No. 3

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JOURNAL OF MAMMALOGY

Published Quarterly by the American Society of Mammalogists

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BALTIMORE, MARYLAND

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The Journal of Mammalogy

Subscription rates, $3.50 per year; single numbers $1.00 each. Sent free to all members of the American Society of Mammalogists not in arrears for dues.

Subscriptions, changes of addresses, requests for missing numbers, applications for advertising rates, etc., should be sent to the corresponding secretary, A. Brazier Howell, Department of Anatomy, Johns Hopkins Medical School, Baltimore, Md.

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JOURNAL OF MAMMALOGY

Published Quarterly by the American Society of Mammalogists

VOL. 9 AUGUST, 1928 No. 3

THE PERIOD OF GESTATION IN THE MONKEY, MACACUS RHESUS, FIRST DESCRIPTION OF PARTURITION IN MONKEYS, SIZE AND BEHAVIOR OF THE YOUNG

BY CARL HARTMAN

[*Plates 17–18*]

So far as the writer is aware, there exists no authentic record of the period of gestation in any monkey, aside from the single case recently reported from the Carnegie colony (Hartman, 1928a, b); nor has any detailed account been published of observations on the birth processes of any primate other than man.[1] Although the species *Macacus rhesus*[2] is rapidly becoming an important laboratory animal and is likewise popular in all of our zoological parks, it is impossible to gain from the

[1] Since this paper was written my attention has been called to a brochure received by Dr. Aleš Hrdlička, of the U. S. National Museum, from Dr. Louis Montané, entitled: Histoire d'une famille de Chimpanzés. Etude physiologique. Paris, 1928. Doctor Montané here gives the later history of the chimpanzees kept at the Quinta Palatino estate near Havana, Cuba, including a brief account of Mrs. Abreu's observations on the birth of the second young of the female "Cucusa." The circumstances of the birth were not normal, however. Cucusa ate the placenta.

[2] Although there is tremendous confusion in the nomenclature of Primates, the species imported in large numbers into this country under the name of *Macacus rhesus* seems to be well defined. Elliot (1912) uses *Pithecus rhesus*. According to Dr. Charles Wardell Stiles, however, both *Pithecus* and *Macacus*, as applied to the rhesus monkey, are dead homonyms. Doctor Stiles would use *Silenus rhesus* or *Silenus* (*Rhesus*) *rhesus*. Until the matter is officially determined by the International Commission on Zoological Nomenclature, I shall continue to use the name *Macacus rhesus*.

literature any information that might guide one in estimating the age of a given animal; nor has any one as yet measured the new-born, full-term rhesus baby. The present paper, based on careful observations and matings of mature females in our colony, marks the beginning of an effort to supply such information concerning this interesting primate. Some additional points, chiefly of medical interest, are being reported in a forthcoming paper on the same subject in the Bulletin of the Johns Hopkins Hospital (Hartman, 1928c).

SEXUAL MATURITY

Age of puberty

The basis for our estimate of the age of the primipara (No. 4), the delivery of whose baby was witnessed by us, is furnished by measurements made of a male born May 19, 1925, hence, at the time of this writing, about 3 years old. This male[3] has now just reached the size of an average small rhesus monkey, such as one is able to purchase on the market from the various importers. Being in excellent physical condition, he weighs more than the average female of the same sitting height. The female in question was just such a small animal when received by Dr. S. J. Crowe for experimental purposes in the spring of 1925. She was acquired by the Carnegie colony the following spring and a little later exhibited the three signs of puberty which are recognized at the present time: the sex skin over the buttocks reddened, bag-like swellings appeared in the pubic region, and she menstruated. The swellings of puberty are usually confined to the region correspondng to the scrotum of the male and may well be homologized with it; it is in this region, too, that the sex skin is visible ventrally. Inside the distended folds one often finds hard lumps, rounded or elliptical, which roll between the fingers like testicles and have, indeed, been mistaken for them, and the female possessing them has been taken for a male (pl. 17, fig. 1). In

[3] The following table gives some weight and growth records of our male B, "Mel," born May 19, 1925, to female No. 7.

	DATE					
	April 28, 1926	June 19, 1926	May 18, 1927	September 28, 1927	November 30, 1927	April 20, 1928
Sitting height, mm	308	312	358	375	383.5	418
Weight, grams	1,360	1,445	2,080	2,570	2,930	3,615

this particular female the last record of these swellings was in June; the first observed menstruation occurred July 12 to 16. Since older animals never exhibit the swellings just described, these may be considered signs of early puberty. Older females, however, as also the younger ones, sometimes do show a swelling and edema, occasionally almost pathological in extent, over the buttocks, the hips, and the base of the tail (pl. 17, fig. 2)—parts that redden, especially in the interval of the menstrual cycle (Collings, 1926). These swellings[4] are rare, however, and quite a different thing from the more localized pubic swellings of adolescence.

Menstrual cycles

At first irregular, the menstrual cycles in female No. 4 became fairly regular during the succeeding winter until April 26 to May 5, after which there followed a long period of amenorrhea due to the heat of summer (cf. Hartman, 1928b). The first days of the menstrual flow were as follows: July 12, August 23, November 4, November 30, December 29, 1926; January 31, February 26, March 25, April 26, September 12, 1927. The animal was mated on September 22 and conceived.

The menstrual cycles of the younger monkeys are usually much more irregular and unreliable than those of older females, both in the length of the interval and the duration of the flow. It is also believed, from experience in this colony and the experiments of Corner (1923) and of Allen (1927), that during early adolescence the females are more or less sterile for lack of ovulation, menstruation in the younger females proceeding before ovulation. The swelling of the sex skin seems to be due to the follicular hormone arising from the ovaries (Allen), but it is probable that in the younger females the follicles do not always reach maturity.

To summarize, then, it is certain that female No. 4 had attained the age of at least four years at the time of the onset of puberty.

[4] Swellings over the whole of the "sex skin" (the region involved in the reddening of sexual maturity), as, for example, in figure 2, occur in not over one-fourth of the females, and in these it occurs only occasionally. The cycles in which the swellings occur are lengthened (up to 3 months) and the swelling itself and the reddening may persist throughout the greater part of the extended cycle. On theoretical grounds it was concluded that the swelling, like the reddening, was due to one or more persistent graafian follicles, or possibly to a cystic ovary. The hypothesis was tested in one case; a large atretic follicle was found and removed. Within 3 days the swelling and the redness were greatly reduced (Hartman, 1927, 1928c).

Size of adolescent females

In answer to the question, at what size and weight does the female *Macacus rhesus* attain sexual maturity, a few facts are available, which are here given for what they are worth.

Allen gives two different weights in this connection: one, when the sex color and swelling of the buttocks first appear, and the other, at the first menstruation. One would also like to add the time of the first ovulation. Three of Allen's female monkeys attained the stage of definite sex color at 3510, 3130, and 2900 grams respectively; the first menses at 4470, 3130, and 3170, respectively.

Our female No. 4, referred to above, weighed 3345 grams at the time of the first menstruation and measured 410 mm. in sitting height. This is an average case, as inferred from weights and measurements made on half a dozen other individuals entering sexual maturity. A fairly safe guide in selecting rhesus females, if one desires them to be sexually mature, is to require them to be at least 410 mm., or slightly above 16 inches, in sitting height, and to weigh somewhat over 3 kilograms, or about 6½ pounds.

Other menstrual histories

Aside from the more interesting pregnancy of female No. 4, which disclosed the manner of parturition of its kind, four other pregnancies have recently occurred in the Carnegie colony. The menstrual histories of the four females are given in outline form, as follows:

No. 2. Multipara; discussed in a previous report. Gestation 168 days.

No. 7. This female had a baby in 1924, which died. Gave birth to the male mentioned above in May, 1925. She was received by us January 20, 1926; weight on May 9, 1926, 4822 grams. She suckled her baby for over a year. Early in September, and again a month later, she was severely ill, with convulsions, but recovered with no apparent deleterious effects. The first days of the menstrual periods were as follows: September 5, October 25, November 25, December 26, 1926; January 27, February 23, March 20, April 18, May 16, 1927. There then followed a long period of summer amenorrhea. The next menses noted were those of October 7. She was mated October 17, that is, on the tenth day, and became pregnant. She showed the "placental sign" of pregnancy November 4 to 25. She gave birth to a 450-gram male baby on March 23, 1928, at the end of a gestation period of 159 days.

No. 36. Imported with baby early in 1927; baby died on the voyage

from Singapore. Received April 29. The first days of the menstrual periods were: May 3, June 17, July 12, August 12, September 5, September 26, October 20, November 14, December 7, 1927. She was mated December 16; the placental sign began December 30 (not examined December 29) and continued for eleven days, but reappeared on the twenty-second day.

No. 41. Primipara; sitting height 465 mm., weight 3810 grams when received April 29, 1927. Sex swelling appeared in July. September 28 she weighed 4350 grams. Menstrual history is very irregular until late in the calendar year. Menstrual flow began on the following dates: May 27 (slight), August 5, September 12, October 26, November 25, December 21; the intervals being 70, 38, 44, 30, and 26 days. The mating, December 31, 1927, to January 2, 1928, resulted in pregnancy, although no sperms were recovered from the vagina of this female on January 2. The placental sign appeared on January 20 and continued to February 10.

MATING AND CONCEPTION

As explained in detail in connection with the report of the first gestation studied by us, matings were timed on the basis of a low leucocyte count in washings made from the vagina with salt solution after a method designed to render counting of cellular elements as accurate as possible (Hartman, 1928b). This exact timing is permitted by the fortunate circumstance that, as a general rule, the females will accept the male whenever given the opportunity. We have at least a hundred observations on this point. Some females have, however, consistently refused the male, and certain ones have an antagonism to one or the other of our males, but the stage of the menstrual cycle has nothing to do with their refusal or acceptance. At first the females were mated when the leucocyte count had reached zero (or the lowest point for a particular female in which zero is never reached), on the assumption that the ripe graafian follicle which is to furnish the ovum to be fertilized matures synchronously with the repression of leucocytes from the vagina. But matings at this time have proved uniformly sterile, although pregnancies have resulted from matings made while the leucocyte curve is falling. Hence, for the present, it is assumed that there is a delay in the response of the vagina to the stimuli issuing from the ripening follicle. Thus, female No. 2 was mated from the eighth to the tenth day after the beginning of the menstrual flow; No. 36 and No. 41 on the ninth day, No. 4 and No. 7 on the tenth day.

To judge by the vaginal content, conception (ovulation) and copulation would seem to have been nearly synchronous in the five cases before us. It is possible, of course, that ovulation occurred some days later, the sperms remaining viable in the interval. Corner found a tubal ovum in the same species of monkey on the fourteenth day of the cycle and an egg in the uterus on the seventeenth day. Allen duplicated the former finding and also discovered an egg in the tube on the tenth day. But even in these cases, since the ovum of the monkey can hardly be expected to traverse the tube in less than three days, the usual time for most mammals, large or small, there is a latitude of several days in the figures of the authors quoted. Our monkey No. 1 died of fulminating pneumonia on the sixteenth day of the cycle,[5] when two freshly discharged follicles were found in one ovary. The corresponding tube was sectioned, but no ova were found in it. Until further facts are known, it seems that the tenth or the eleventh day of the cycle may well be accepted as the probable modal point for ovulation in the monkey, even though this is probably several days earlier than in the human female with a similar menstrual cycle.

PREGNANCY

Length of gestation

On the supposition that the ovulation time, as set forth in the preceding section, is correct, the exact length of the gestation period in the three cases here considered is as follows: No. 2 (multipara), 166 to 168 days; No. 7 (multipara), 159 days; No. 4 (primipara), 174 days. These figures approach 5½ months as a rough average, or 1½ months less than the several estimates of 7 months heretofore attempted (cf. Hartman, 1928 b).

OBSERVATIONS DURING GESTATION

While the gestations with which we are here concerned were in progress, the animals were kept under close observation and were examined at least weekly. No. 4 was watched day and night for eleven days before parturition. Some of the observations recorded in the protocols are presented here.

[5] Erroneously stated as the 11th day, p. 536, Hartman, 1928b.

Sex color

A most brilliant sex color was always maintained during the entire gestational period and for several weeks after parturition. Not only was the whole sex skin of the buttocks, hips, and base of tail involved, but in some cases (as often also during the menstrual cycle) the color would spread in red splotches down the legs and over the calves to the heel; and there might also be a forward-tapering streak of red splotches from the symphysis to the umbilicus. The nipples were bright and usually surrounded by an elliptical area of red splotches, the areolae. Late in pregnancy a number of duct openings were visible around the apex of the nipple. The faces of some females partook of the general reddening—the same females that are also flushed during the interval of the menstrual cycle, as, for example, No. 2.

Since the experimental work of Allen, the sex color must be ascribed to the follicular hormone or (in pregnancy) to the placental hormone. Perhaps these two hormones are identical substances. It may be noted in passing that males also exhibit brilliant reddening of the buttocks, which changes from time to time, probably according to the general state of wellbeing of the individual.

Abdominal palpation

The first sign of pregnancy (it was noted above) consists of the placental sign, a prolonged though slight bleeding during the implantation of the ovum. Soon after the disappearance of free red blood cells from the genital tract, or about the fortieth day of gestation, it is possible, by palpating the abdomen with the fingers of one hand, to feel the uterus as it enlarges and pushes forward in the abdominal cavity above the symphysis pubis. About the ninth week the amniotic fluid is sufficient to cause great distention of the uterus, now soft and almost impalpable; but the change enables one to feel the fetus and follow its growth to the time of birth.

Enlargement of the abdomen

From the end of the second third of gestation, the enlargement of the abdomen is quite apparent, statements to the contrary notwithstanding. This may be seen (pl. 18) by comparing figures 3 and 4 with figure 5. Figure 3 was taken one month before, figure 4 three days before, figure 5 one month after parturition.

Vaginal content during gestation

A lavage of the vagina of a pregnant female contains very few cellular elements, as contrasted with the condition during the menstrual cycle, when the desquamated cornified cells produce a milky white suspension. The condition of the vaginal epithelium, therefore, approaches that found during other periods of amenorrhea. There are a few epithelial cells, sometimes of bizarre shape, and a few leucocytes, though in early pregnancy a more massive leucocytosis may appear temporarily. Late in pregnancy the leucocytes of the vagina increase in number and become highly motile, which indicates an easy and rapid migration through the mucosa, doubtless for protection against the invasion of pathogenic organisms. No cells characteristic of pregnancy were at any stage recovered from the vaginal lumen.

Version

It is well known to obstetricians that the head presentation in the human species constitutes the usual and the more favorable position of the fetus for expulsion during labor. During the greater part of pregnancy the human fetus assumes various positions, but finally, in most cases, the head presentation is reached and this is maintained until delivery is effected. Spontaneous version, from breech to head presentation, was noted in our monkey No. 4, as shown by X-ray photographs made before and after version had taken place—the first (with breech presentation) on the 130th, the second (with head presentation) on the 137th day of the 174-day gestation period. (See Hartman, 1928c.) The similarity to the ordinary human experience is striking.

Behavior of female during last ten days of gestation

Under continuous observation for the last ten days of her first pregnancy, female No. 4 exhibited marked restlessness. She seemed most uncomfortable, especially when lying; what little sleeping she did was done in the sitting position and then only for a few minutes at a time—only once as long as an hour. At such times quickening could be readily observed. Several times she seemed to be going into labor; she certainly was suffering considerable pain. For two days she suffered from incontinence of urine. A multipara (No. 7), 3 weeks less advanced in pregnancy, seemed very placid in contrast to her smaller cage-companion. The latter lost a significant amount of weight, dropping from 5000 to 4500 grams just before parturition, a phenomenon which has its

parallel in the human female. Female No. 7, whose disposition was little affected by the gestation, lost only 140 grams, which is hardly significant.

PARTURITION

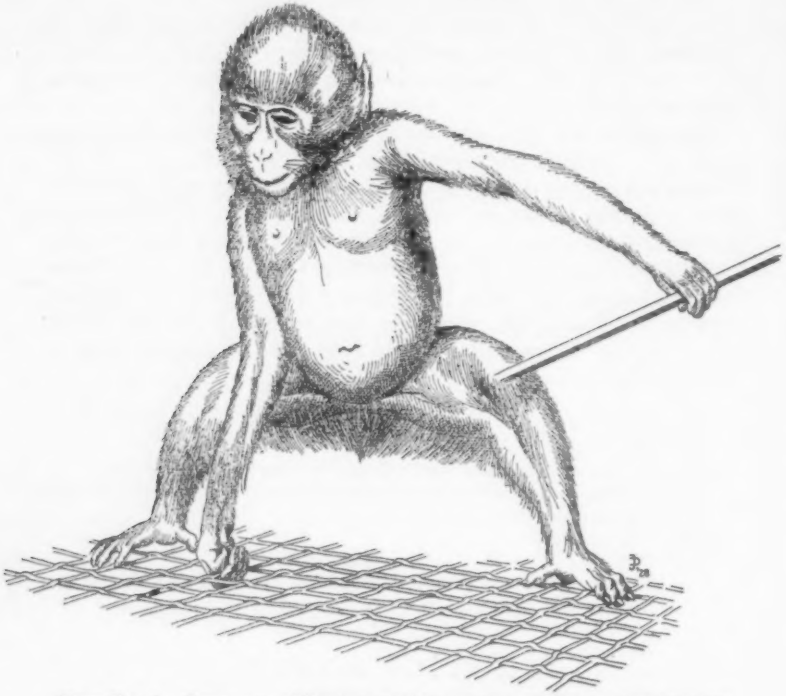
For the forenoon of March 14 there are few notes concerning the parturient female that was to disclose her secret at 4:00 p.m. of that day. Her actions were not calculated to arouse suspicion that parturition was imminent.

At 2:00 p.m. she was under observation for fifteen minutes and again twice later. At 3:20 the writer was called to the scene, for at last the monkey was acting "differently." She was squatting on the wire floor of her cage, legs spread, vulva 5 cm. from the floor. Her breath was labored and she was straining considerably. The wire floor offered a foothold, which the monkey took advantage of as she strained with her abdominal muscles to assist the uterus in the expulsion of the fetus (text fig. 1). During the process the face was visibly flushed. There were a number of labor pains between 3:20 and 3:35 p.m., after which the following protocol records them all:

3:38. Squats; strains.
3:40. Sits quietly.
3:41. Squats; strains; gives every evidence of being in great pain.
3:43. Squats; strains, while she holds on to the wire; grunts audibly; face exhibits evidence of pain.
3:44. Lies and rests.
3:46. Still lying; fetus seems to be kicking.
3:47. Squats; strains and grunts quite loud, indicating contraction of the abdominal muscles. The act strikingly simulates difficult defecation.
3:48. Rests, lying.
3:49. Squats; strains; holds on to wire wall and corner post.
3:50. Lies; twists buttock around now and then.
3:51. Squats and strains very hard.
3:54. Squats and strains harder than ever; breaks wind.
3:55. Lies.
3:56. Squats and strains again, less than before.
3:57. In sitting position, holding on to post.
3:58. Lies and rests, though face shows pain.
3:59. Moves about in squatting position.
4:00. Lies.
4:01. Squats and strains; then walks the length of the cage (one meter) on hind legs; strains.

4:04. Puts hand in vagina, whence fluid is passing; licks hand. Crown of head of fetus is now visible. Female continues to catch drip of fluid from the vagina, avidly licking it up, every drop.

4:08. Head of fetus is out; mother walks around with head of fetus out, occasionally tugging at it, especially by an ear.



TEXT FIG. 1. SKETCH OF A MACAQUE TO ILLUSTRATE THE SQUATTING POSTURE ASSUMED BY THE PARTURIENT FEMALE

See text. James F. Didusch, artist

4:10. Mother grasps head of baby first by one hand, which slipped off, then with both hands, and pulls baby out instantly, once she had hold of it. The baby is at once licked—head, body, hands. The hands are taken into the mouth and sucked and apparently scraped with the teeth, as the baby cried several times during this process, the first proof that it was alive and breathing.

4:13. Placenta is expelled. Female continues to lick baby, at first giving little attention to the afterbirth.

4:16. Cord is bitten at but not severed. Placenta is dragged around by cord, still attached to baby.

4:17. Baby crying; seems to feel drag on cord. Much licking of baby until 4:35.

4:35. Eating of placenta begins (licked at several times before). Once started, the female proceeds most voraciously. The baby is, for the time, laid on the floor in front of her. Bite after bite is taken, part being swallowed directly, part stuffed into the food pouches, to be chewed later. At times, a piece too large and tough is taken, to be pulled out of the mouth by the blood-covered hands and chewed at again. After the placenta is disposed of (4:42), the hands and floor are licked clean and the muzzle washed.

4:50. Chewing of placenta is completed. Baby is again taken up and given a further licking.

5:00. Chews umbilical cord, which she seems now to have found accidentally. The cord is chewed down to within 5 cm. of the baby. At times the cord gives trouble and is pulled through the teeth.

5:06. Chewing of cord ceases, leaving 5 cm. attached to the umbilicus. (When the tag of cord disappeared is not known; in 41 hours the umbilicus consisted of a nipple-shaped eminence about 10 mm. in diameter at the base.) The baby's eyelids are closed.

5:10. Mother clasps the baby to her bosom, as is the fashion of monkey mothers. The baby is capable of holding on to the mother, making deep creases in the skin where its fingers dig in.

Parturition, then, consists of a complex series of reactions in which all of the physical powers of the female are brought into play. It is, normally, not merely a contraction of the uterus under the stimulus of the pituitary secretion while the rest of the soma detaches itself, as it were, in a kind of twilight sleep; it is not that in Nature, a fact which must be considered in attempts to perfect the technique of making labor as painless as possible. We are accustomed to think of the normal woman in labor, intelligently conscious of what she is about, as throwing herself, by supreme effort of the will, into the business of giving birth to her baby. Such an explanation of parturition is at most anthropomorphic. The monkey acts likewise, involuntarily putting forth every effort of her entire body that might be calculated to consummate the process; she acts in response to somesthetic stimuli coming from the contracting uterus and the dilation of the parts. The complex of reactions involved are doubtless the common denominator of the birth process throughout the mammalian series. Even in the opossum, in which the young are born as embryos and parturition certainly must be comparatively easy (Hartman, 1920, 1928e), I have been able to elicit

in the pseudopregnant female the preparation of the pouch for the non-existent young, by the injection of pituitrin.

It is further seen that the monkey assumed the half-sitting or squatting posture during labor (text fig. 1). This is also the posture that was formerly much more commonly adopted during labor by the women of Europe, where in recent times medical science has insisted on the lying position. Perhaps the sitting posture,[6] which still holds among the primitive and savage peoples generally, as also throughout China, is, after all, the normal and best one. As one observes the monkey as she grasps the wire floor of the cage and brings every pressure to bear on the abdomen, one feels that the sitting posture is best calculated to bring about delivery.

In eating the placenta the monkey doubtless follows a practice of its ancestors throughout the geological epochs of the past. Certainly, the reaction towards the placenta is common to all deciduate mammals, herbivores and carnivores alike. In this man is not excepted, though the custom is no longer practised generally. The physiological function of the placenta in the economy of the puerperal mother has not as yet been fully elucidated, though the suspicion that the placental hormones have to deal with milk secretion seems to be well founded.

Behavior during the first night

At 6:00 p.m. the baby's eyes were mere slits; at 8:00 they were wide open. During the night the mother remained rather quiet and the baby slept most of the time. At times the mother would "talk" or croon over the baby in the most human fashion; frequently she licked it. At 8:30 she drank a great deal of water; later she ate a goodly portion of food. When she walked across the cage it was on her hind legs; with her arms she would clasp the baby to her breast. The baby several times cried or squealed, when the mother would lick it and cuddle it closer to her. At frequent intervals throughout the night the female would reach her hand into her vagina and then lick the exudate from her fingers.

No suckling was attempted the first night. It was not until 1:30 p.m. of the following day that the baby, now 21½ hours old, seemed to be suckling; at 4:00 it was certainly using the left nipple; at 5:00 it was seen to take the right nipple. The baby found the nipple by trial and error, by its own efforts, the mother apparently assisting no more than

[6] Human postures during labor, and their geographical distribution, are tabulated by Ploss and Bartels, Das Weib, vol. 2, pp. 174–175 of the 1908 edition; section entitled, *Die Verbreitung der Geburtsstellungen über die Erde.*

blindly holding the baby to her bosom. When the little one started to suckle, the mother flinched, as though the process were painful. She slept, for the most part, sitting up.

Size and weight of the new-born

Male G, son of female No. 7; born early morning of March 24, 1928; measured and weighed the same forenoon. Sitting height 195 mm., weight 450 grams. For a week or more the mother was ill; a meager amount of milk could be squeezed from the left nipple only. The baby was, therefore, given supplementary feeding of whole milk plus 8½ per cent sugar three times daily. The baby had no teeth at the end of two weeks; it had, however, erupted the two upper middle incisors at the end of the fourth week. The mother weighed 6700 grams the day before parturition; 6030 grams several hours after parturition, March 24; 6050 grams, March 31; 5720 grams, April 2; 5690 grams, April 5; 5415 grams, April 19. Despite this loss, she seemed well on the last date and the baby had lost interest in the supplementary feeding.

Male F, son of female No. 2, born October 3, 1927. The baby was not worried with weighings until December 1, 1927, when it weighed 890 grams. March 16, 1928 (when about 5½ months old), he had a sitting height of 269 mm. and weighed 1425 grams. He then had a full complement of twenty milk teeth.

Female No. 50, daughter of female No. 4; delivery observed, as described above, March 14, 1928. Forty-one hours after birth the baby measured 186 mm. in sitting height and weighed 412 grams. In two weeks a substantial growth could be recorded and six teeth, four upper and two lower incisors, had erupted.

SUMMARY

1. The period of gestation, from conception to birth, in three cases of *Macacus rhesus*, was found to be 174, 168, and 159 days—respectively.

2. The day of conception is believed to have been about the tenth day after the beginning of the menstrual flow in each of five pregnancies. Reasons are given for such a conclusion.

3. The female *Macacus rhesus* does not arrive at sexual maturity before the fourth year. Signs of sexual maturity are discussed; size and weight of adolescent females are given.

4. During early adolescence the menstruating female probably does not ovulate, hence is sterile for a year after the onset of puberty.

5. From the fifteenth to about the thirty-seventh day of gestation, pregnancy reveals itself by minute leakage of blood from the implan-

tation site. The bleeding may attain the intensity of a light menstrual flow. This is the earliest sign of pregnancy. It probably explains the single slight menstruation experienced by many women after conception.

6. The monkey gives birth in the near sitting or squatting position, a posture even now assumed by the majority of human females in the parturient condition.

7. Like all deciduate mammals, the monkey eats the afterbirth.

8. Two new-born rhesus babies weighed 412 and 450 grams, respectively, and had a sitting height of 186 and 195 mm., respectively.

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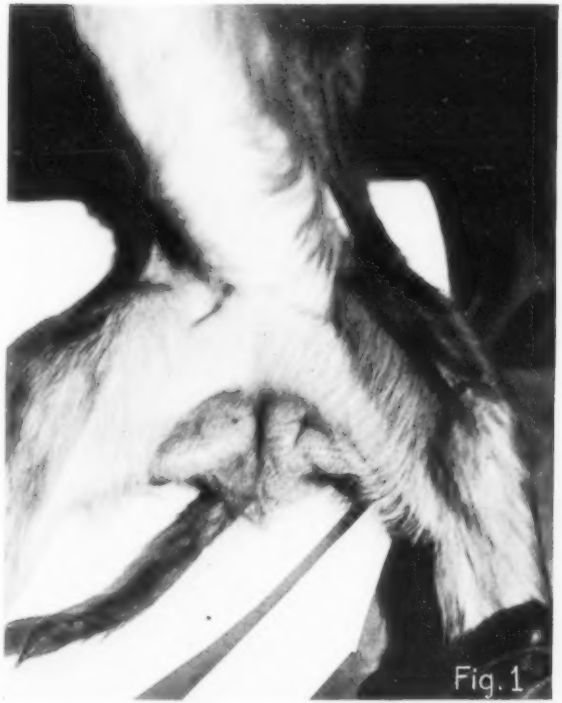

FIG. 1. Ventral view of "scrotal" swellings in an adolescent female. Such swellings occur at puberty, almost never later.

FIG. 2. Buttock of female showing excessive swelling of the sex skin, which is in part thrown up into transverse rugae. The swelling involves also the base of the tail and the hips above the sitting pads.

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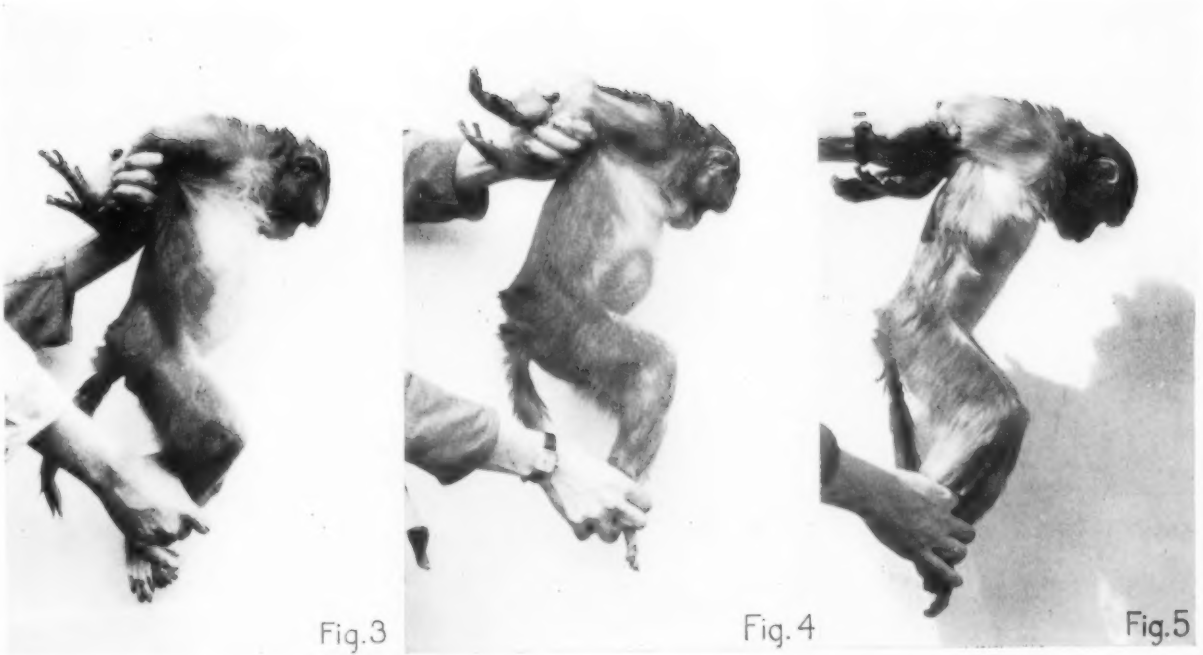


FIGS. 3, 4, AND 5. Female No. 4, one month before, three days before, and one month after parturition. With the advance of pregnancy the abdomen enlarges perceptibly.

GETTING PUBLIC SUPPORT FOR MAMMAL PROTECTION

By Ernest P. Walker

Those who are studying mammals are the proper ones to take an active part in the perpetuation and upbuilding of the wild stock. Proper administration of our game and fur bearers calls for the technical information that can often be supplied only by the scientific student of mammals, and the mammalogist should not only develop the essential information but he should also see that it is put to use. Information that is not made use of is of little value, and the work of the scientific man must not end with the development of his idea or the assembling of information. His duty is either to put it to use in a practical way himself, or else so to present his findings that other workers can make use of them.

The crying need of the present day is to protect and build up the stock of most of our animals. The obvious way to do this, under the present conditions of land utilization, is to kill fewer animals, but the real problem is to induce self-interested people to do this. If, however, we can show them that it will be money in their pockets to do so, we shall be able to gain a large following.

It was reasoning along such lines that led me to try to show graphically the reason why there is a need for more constructive wild-life administration, and also to show how wise protection can be made profitable.

The diagrams and graphs that I have developed are of two main types, with various modifications and combinations of these two types. For want of a better name I term the first "Progressive utilization and extermination of a species." It is an attempt to enable one to visualize what today is probably the greatest problem with which the wild-life administrator is confronted. It is based upon the fact that a given area of land or water or both can continuously support a certain maximum number of breeding animals and their progeny until the reproductive stage of such progeny is reached. There are, of course, innumerable factors that affect this condition, but the basic principle is that an area can sustain up to and not beyond a certain abundance. If the stock is increased above the carrying capacity of the area its productive capacity is lessened, and this naturally leads to ultimate reduction of numbers. If the area is not fully stocked it will not produce as large a crop as it might under best utilization.

If more than the normal annual surplus produced by the basic breed-

ing stock is taken, the breeding supply will be reduced and production can not be sustained. If all the surplus is not used it is not only wasted but it also becomes a source of danger through overstocking.

This is intended to make clear the fact that there is a very definite critical point which, if passed in the case of any valuable animal or plant, leads to reduced production and threatened extermination.

With the foundation idea established of maintaining a definite maximum breeding stock and harvesting only the surplus, we next have for

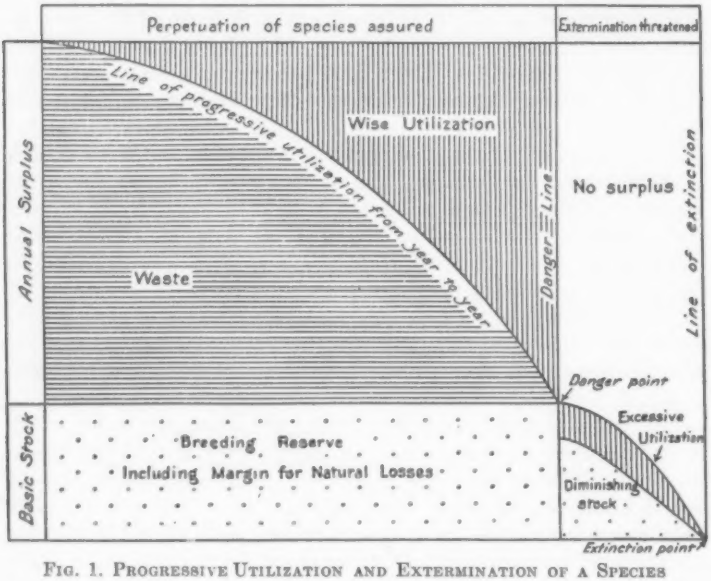


FIG. 1. PROGRESSIVE UTILIZATION AND EXTERMINATION OF A SPECIES

consideration factors that must guide us in harvesting the surplus. Different factors, of course, are operative in different animals.

The land fur bearers are a group of mammals that are utilized in a rather uniform manner and are subject to certain fairly constant factors. I have accordingly developed a graphic representation for presenting the changes in the value of the skin of a land fur-bearing animal in the course of a year—what might be termed "The Cycle of the Fur." The graphs are not intended to be exact but rather to illustrate the

underlying principle. They are based upon statistics of Alaska furs, supplemented by an intimate knowledge of fur conditions in the territory. They have also been modified to meet suggestions made by fur dealers and trappers. Each graph represents a general average for the various species in southeastern Alaska over a period of years but can also represent equally well an individual fur bearer.

The practical application of these is obvious, namely to indicate the proper period for open seasons. The next problem is to demonstrate to

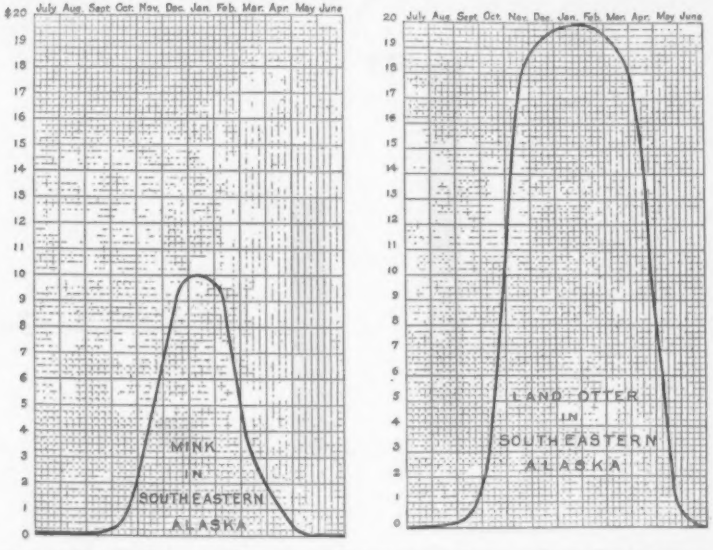


FIG. 2. GRAPHS SHOWING CHANGES IN VALUE IN THE SKINS OF LAND FUR-BEARING ANIMALS DEPENDING ON THE DATES ON WHICH THEY ARE KILLED

the public why it is good business to prevent encroachment on the breeding reserve; and if the stock has already been depleted it is even more important to indicate where use must be curtailed in order to restore the proper capital of breeding stock.

To illustrate this, the fur bearers have again been drawn upon for an example. It is well known that in general the trapper takes the greatest portion of his total catch during the earlier part of the season; and that the daily catch declines as the end of the season approaches. This, of

course, is due to the fact that there are more animals available for him at the opening of the season and that they are less wary and thus more easily taken. To illustrate this point and another still to be brought out, let us assume that on a given area one thousand skins of a fur bearer might be taken during a three-months' open season. The first month there would probably be 575 taken, the second month 375, and the third month 50.

In the example just given it has been indicated that one thousand skins would be taken on the area. Let us assume, however, that the

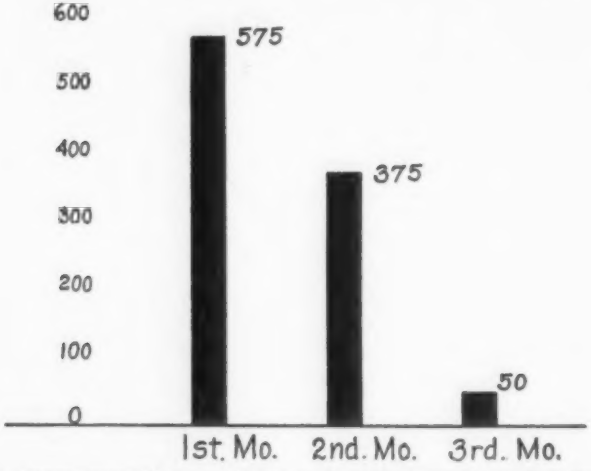


FIG. 3. APPROXIMATE MONTHLY TAKE OF ONE THOUSAND LAND FUR BEARERS KILLED DURING A THREE-MONTH TRAPPING SEASON

taking of this number of animals will not only consume the surplus but will also make inroads on the basic breeding stock or capital. Under these conditions a wise administration demands that the taking of part of this number be prevented. How can this be done and still satisfy the trapper, the manufacturer, and the consuming public? If the season be shortened a little at both ends, reducing it to two months, let us suppose that this will save fifty animals and that it will prevent encroaching on the breeding stock. It is a matter of surprise to many that the 950 animals taken in two months will be worth more than would be the one thousand taken in three months.

This may be illustrated by combining the graph showing pelt value by primeness with that showing the total fur taken by months. Of the thousand animals trapped, the 575 of the first month of the open season will be taken mainly before they are prime or in the best market condition; the 375 of the second month are the only ones taken within the

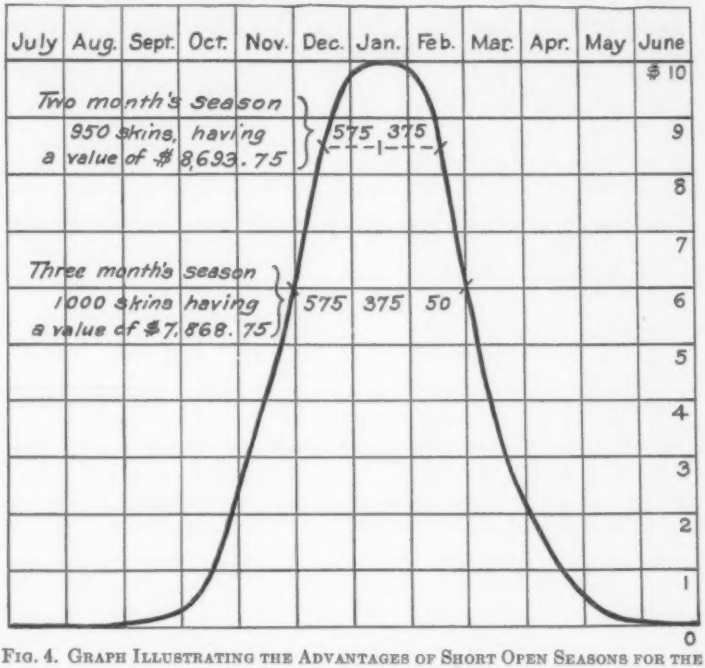


FIG. 4. GRAPH ILLUSTRATING THE ADVANTAGES OF SHORT OPEN SEASONS FOR THE TAKING OF LAND FUR BEARERS

period of their maximum value; and the 50 of the third month are taken when their value has considerably declined. The value of this take would be about as follows:

575 animals @ 7.00 =	$4,025.00
375 animals @ 9.25 =	3,468.75
50 animals @ 7.50 =	375.00
Total value of 1,000 skins =	$7,868.75

On the other hand the two months' season allowing a take of 950 animals with fur in prime condition in practically all cases would produce:

575 skins @ 9.25 = $5,318.75
375 skins @ 9.00 = 3,375.00

Total value of 950 skins = $8,693.75

Thus by taking 50 fewer animals in two months the actual receipts from the fur crop would be $825 more than would have been brought from the 1,000 animals taken over a period of three months.

In this way the two principal objects have been accomplished, namely saving the adequate breeding stock and increasing the profits.

CONCLUSION

I have ventured to submit these ideas for four reasons.

1. A majority of the people do not realize the problems of wild-life conservation.

2. Surprising help can be obtained from the public when they are made to see the problems, and that they will profit directly or indirectly by assisting.

3. The graphic presentation assists in interesting persons who can not otherwise be made to see the problem.

4. When once the public is clear on these matters we can rely on their active support of sane measures.

U. S. Biological Survey, Washington, D. C.

NOTES ON THE LIFE HISTORY OF THE SAGE-BRUSH MEADOW MOUSE (*LAGURUS*)

By E. Raymond Hall

About sixty years ago Coues (Proc. Acad. Nat. Sci. Philadelphia, 1868, p. 2) and Cooper (Amer. Nat., vol. 2, 1868, p. 535) described, under the generic name *Arvicola*, two species of voles, *curtatus* and *pauperrimus*, respectively. These apparently were the first references in literature to American specimens of *Lagurus*. Subsequently, three other forms were described: *pallidus* by Merriam (Amer. Nat., vol. 22, 1888, p. 704), *intermedius* by Taylor (Univ. California Publ. Zool., vol. 7, 1911, p. 253), and *artemisiae* by Anthony (Bull. Amer. Mus. Nat. Hist., vol. 32, 1913, p. 14). Although diligently sought after by collectors, relatively few of these mice have been obtained. Also, but little has been recorded concerning their habits. It was, therefore, a matter of more than ordinary interest when numerous colonies of these mice were discovered, in May, 1927, by Miss Annie M. Alexander and Miss Louise Kellogg on the eastern slope of the White Mountains along the California-Nevada boundary.

At that place, around 8200 feet altitude on Chiatovich Creek, Esmeralda County, Nevada, forty-seven specimens were taken. In the next canyon south, at 9100 feet on Indian Creek, in Mono County, California, Miss Alexander and Miss Kellogg found additional colonies that had been occupied during the previous winter. The notes of these collectors, those of Mr. Jean Linsdale and the present writer made at the same time and place, and those contained in the field notebooks on file in the California Museum of Vertebrate Zoology relating to a few previous findings of *Lagurus*, permit of placing on record here the following facts about the habits of these mice and concerning their summer and winter homes.

In the new world this genus ranges over the semi-arid parts of northwestern North America. It is not known south of the latitude of Death Valley or west of the Sierra Nevada. It occurs interruptedly in central Washington and in the western parts of Oregon and California. On the north it has been taken at Calgary, Alberta, and in Montana. Eastern records of occurrence are from western North Dakota and northwestern Colorado. It has also been taken in the states of Nevada, Idaho, and Utah. Zonally it occurs in the Upper Sonoran and Transition zones and possibly in the Canadian Zone. In the White Mountains of California it has been taken from 8000 feet to as high as 10,500 feet.

At Ironside, Oregon, it has been found at slightly less than 4000 feet elevation.

Most of the known specimens have been taken in sage-brush (*Artemisia* sp.). In fact, in California and in Nevada, these mice have been found only in a certain type of sage-brush. They occur where the bushes are scattered several feet apart, have a uniform height of about two and one-half feet, are of uniform age or stage of growth and where the lower branches, as naturally would be the case in plants so low, are near the ground. In situations of this kind the animals have been successfully looked for in several parts of the White Mountains; but in adjacent situations where the sage-brush has a markedly different growth form, no *Lagurus* were found.

The species *pauperrimus* appears to be the only one not usually found in sage-brush. Bailey (N. A. Fauna, No. 17, p. 69) gives its habitat as "Open grassy ridges or high prairie, except in the Uinta Mountains, where they were found in grassy parks near the lower edge of pine timber." Cooper (*loc. cit.*, p. 535) says of *pauperrimus:* "I found it common on the Great Columbian Plain, after getting quite out of sight of trees, and where the ground is covered uniformly with a coat of short scattered grass. . . . . It was even more abundant on the grassy rolling hills between Snake and Walla Walla rivers. . . . . "

Cooper (*loc. cit.*) found the animals to be abundant over a considerable area in Washington, but other collectors have found the mice only in relatively small, isolated colonies. What factors are responsible for this local distribution we do not know. The colonies are not permanent; at least the experiences of collectors returning to places where the mice previously had been taken are that they usually are no longer to be found. Such was the experience of Bailey (N. A. Fauna, No. 50, p. 101) who twice revisited the type locality of *pallidus* without again finding the animals. The writer's search for specimens at the type locality of *curtatus* in the past summer was without positive results.

The mice are not strictly nocturnal. Although specimens were taken during the night in traps set on Chiatovich Creek, nearly as many were taken between the time the traps were looked at in the morning and late in the evening. At that place some individuals were seen moving about during the day. Cooper's (*loc. cit.*) account tells of their ". . . . sunning themselves during the noonday heat or running swiftly from hole to hole;" and Bailey (*loc. cit.*) regards twilight as the favorite time for their activity.

As shown by the feces, a large proportion of the food is composed of

Artemisia. One of the animals taken at Chiatovich Creek had sage leaves in its mouth, and at that place there were cut stems, about three and one-half inches long, of sage strewn along in the runways. On Indian Creek the denuded *Artemisia* bushes and the rubbish present beneath the bushes plainly showed a heavy utilization of this plant as food during the winter. It was interesting that at that place a lower limb of a foxtail pine (*Pinus balfouriana*) that had been buried under the snow along with *Artemisia* bushes that had been largely defoliated by the mice, had not been used as food although the various runways through the snow passed round and through the clusters of needles. Bailey (*loc. cit.*) has listed the flowers of *Artemisia frigida* and *Liatris graminifolia* and the seeds and heads of *Eurotia lanata* as food items of *Lagurus pallidus* in North Dakota and adds that "Many grasses and other plants had been cut, apparently for food." Thus, the little that is known about the food of these mice indicates that, although they have taken up an arid habitat widely different from the moist one of most kinds of voles and have even become modified in several features of structure to accord with their habitat, they have not adapted themselves to the type of food used by most desert rodents, that is, seeds, but still retain the vole predilection for green foods.

The colony on Chiatovich Creek was on the floor of the valley and extended to the edge of the creek. At least, occupied burrows were as close as two feet to the water. The holes were beneath sage-bushes and the runways radiated from these to connect with holes under other bushes. In most places the runways were without cover; but even on bare ground the mice followed definite paths, after the manner of the vole kind, and did not wander promiscuously about. The paths were two and one-half to three inches wide; thus they were wider than the runways of most kinds of *Microtus*. In one runway two stems of green grass were inclined at such an angle that the *Lagurus* necessarily climbed over them in passing. Such an obstruction certainly would not long remain in the runway of *Microtus*, for the stems would promptly be cut and eaten or at any rate carried out of the path. In this colony droppings were mostly under bushes, but some were scattered along the paths. The excreta resemble those of *Microtus* in shape. In color they are either green or black.

On Indian Creek the winter colony was found on a north facing slope at the lower edge of a snow drift. Indeed only part of the colony was yet exposed; the remainder, of unknown size, extended beneath the snow drift. The most striking feature of the colony was the *Artemisia*

bushes denuded of bark and foliage. Many of the bushes were completely girdled and presumably would die from the effects of the gnawing by the *Lagurus*. Piles of bark, in shreds, and many leaves that the mice had cut off, under cover of the snow, littered the ground. Careful scrutiny indicated that the abundant shreds of bark were removed by the mice so that they could reach the cambium layer which apparently was the only part of the bark they ate. Many of the masses of shredded bark hung in the tops of sage-bushes and had the appearance of nests but I could find none that, on careful inspection, appeared to have been used as such. However, these shreds of bark and cut leaves had, evidently, functioned as flooring for the runways and large chambers that the mice had made in the snow around and in the tops of the sage-bushes.

Three burrows that we excavated here were each about twenty-four inches long. Two extended eleven inches underground and the third only six inches underground. The latter ended in a round chamber three and one-half inches in diameter. Each was unoccupied and contained no nest. No droppings were found in the burrows although they were abundant in the runways.

The number of specimens available is relatively small and on this account the fact that forty-three, or fifty-six per cent, of the seventy-seven specimens are males, may be of little significance in indicating the relative numbers of the two sexes.

Few definite data are available on the breeding habits of this mouse. A female taken June 29 near Barnes, Crook County, Oregon, is labeled as having three embryos; and it is known that several of the females taken at Chiatovich Creek between May 12 and 20 were pregnant. Several young, by weight slightly less than half as heavy as adults, were also taken on the latter date at Chiatovich Creek. Similar-sized young were taken late in July at 10,500 feet altitude in the White Mountains of California.

California Museum of Vertebrate Zoology, Berkeley, California.

A FEW WHITE-FOOTED MOUSE PICTURES

By Tappan Gregory

[*Plate 19*]

It has so frequently happened that a mouse has sprung my trap camera when set for larger game, that I long since promised myself to make a special campaign at very close range in order to do justice to these little subjects. I moved this summer to a new home on a forty-acre tract of farm land in Northfield Township, Illinois. I speak of it as farm land, although there occurs within its limits a small patch of deciduous woods about seven acres in extent. The trees are mainly oaks, with some poplars, and the whole is ungrazed and quite thickly grown up with underbrush. Within about seventy-five feet of the southern boundary of these woods, I cleared off a space several feet in diameter on the rich black earth and there for several days, beginning with July 24, 1927, left bait of various sorts, to find some index, if possible, as to what I might expect to photograph. Carrots, lettuce leaves, beets and cabbage did not seem to hold much of interest for the nightly visitors, but peanut butter and oatmeal flakes were devoured whenever offered. On the thirtieth of July, I set the camera for the first time, but it took several experimental baitings before some necessary refinements of trip and battery were accomplished and it was not until the first of August that any success resulted from my efforts. I have not measured it, but I think the lighter of the two wires must be about twenty-two gauge. My bait that night was peanut butter made into a wad, and impaled on top of the longest of the two trip wires. The distance from the ground to the end of this wire as it stood exposed in the open was about forty-five millimeters and from the lens to the bait just under four feet. The set was completed at a few minutes after ten in the evening and at 6:40 the next morning I found the bait all gone and the trap sprung. The resulting picture (fig. 1) is perhaps the best of my present series. The little mouse that tripped the flash this time appears to be eating the peanut butter with considerable relish, if the curl at the tip of its tail is of any significance at all. It is *Peromyscus*, but whether *leucopus noveboracensis* or *maniculatus bairdii*, I am not sure, except that the locality appears to be distinctly of the character where we might reasonably expect *noveboracensis*.

At seven o'clock on the evening of the second, the trap had been reset, baited as before, and in less than two hours, I found it sprung and all the

bait gone (fig. 2). It took but a a few moments to put everything in readiness again, and I had hardly reached the house when I heard the explosion of the flash once more. This picture was spoiled because of the fact that the mouse moved too quickly to be recorded clearly, with the shutter working at a speed of $\frac{1}{100}$ second. I lost one or two others in the same way. It seems to be possible for these mice to jump so rapidly after the flash that they will not be caught unless the shutter is timed to operate practically simultaneously with the powder.

After resetting the camera and baiting the trip with peanut butter on top of the wire, I thought it might be amusing, if possible, to watch a picture being taken. The beam of an electric flashlight was kept playing on the bait and in two or three minutes I saw a small shadowy form scurrying towards the circle of light, hesitating occasionally in the exercise of admirable caution, and finally slipping into full view. Perhaps it was the same mouse that had been subjected already that evening to the startling effect of the flash on two occasions. If I were a mouse I think this would make me hesitate some time before risking another shock. Whether the same mouse or not, it exhibited considerable uncertainty, at first picking a crumb from the ground, sitting up straight to eat it, whirling around like a dervish several times and giving little short jumps, first one way and then another. I gathered the impression that it was not yet quite certain as to the exact location of the bait, which apparently gave off such a tempting aroma. At length it reached up and as nearly as I could tell, took hold of the wire with both fore feet, nibbled at the bait, removed a mouthful and then sat down on its haunches to consume it. I was astonished that its touch could be so delicate, because the interval of travel required to bring the central wire in contact with the loop of the other wire was certainly not over a sixteenth of an inch. This little mouse was very fastidious, for, after eating its first bite, it stopped to wash its face and give its fur a lick before attacking once more the butter on top of the wire. This last assault pushed the balance of the bait down to the wire loop. At that point a very slight movement of my knee as I shifted my weight, frightened the diner. I then found that the bait in sliding down filled the gap between the two contacts and accomplished complete insulation.

My next offering was peanut butter again, but this time a smaller wad, and in three or four minutes a mouse again appeared, hesitated, sniffed about and shortly located my lure. It pulled some off to eat and then treated the remainder in the same way, after which it stood up

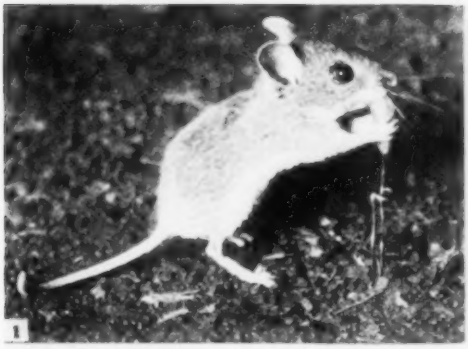
to lick the wire clean before scrambling off. We left the trap reset, but the next morning I was disappointed once more to find the bait all taken away without the flash having been discharged. It was somewhat discouraging and I thought at first that I must have been guilty of carelessness in adjusting the set. Before making it ready again, therefore, I tested the circuit very carefully and succeeded in discharging the fuse, which was used the night before, at the first touch of the two trip wires, demonstrating to my satisfaction that the mice had succeeded in stealing my bait without making this necessary contact.

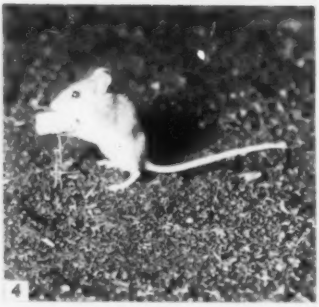
By contrast with the methodical procedure of the first mouse watched, I was interested on the night of the third in the avidity with which another one approached the feast. It came in fact when I was busy with the camera, scampering up, looking for food and once jumping up into the air clear of the ground. Very shortly after I was ready, with the electric light trained again on the bait, a mouse reappeared, skipped around the circle of light and then rushed hungrily and greedily at the bait which consisted of a piece of lean bacon and some peanut butter twisted on to the wire. There was nothing delicate about this one's touch and the flash went off in no uncertain manner. I thought I would like to see what the mouse would do under such circumstances, but it was there and then it was gone without audible sound and I have no idea of the manner of its going. At the flash it simply disappeared from my vision, although I was in no way blinded by the light. The left ear of this mouse was missing, or at least badly crumpled, as indicated in its picture (fig. 3). It returned while I was changing my plate and attacked the bacon ravenously again, finally finishing it, although chased off a couple of times. The set was completed again at about nine o'clock and as nothing came during the next five minutes, I returned to the house to hear the flash go off at 9:15. When I visited the trap, I found the bacon only partly eaten. The last picture was of the same one-eared subject. I should be interested to know why it was so fearless on two occasions and yet did not return to finish this last meal. Possibly it had satisfied its appetite. Once the flash went off before I had time to cover the few rods from the trap to the house, but the next few days were spent in experimenting, having the camera set only a portion of the time, baiting with meat and various vegetables, including the tip of a cob of cooked young corn, and it was not until the night of August 17 that I obtained another good picture. I had two shots that night, one in the early evening, which was blurred by the rapid motion of the mouse. The second one showed a mouse quietly

nibbling and I know it was the second shot because of the leaves which appeared in the picture (fig. 4). They were not there when I reset after the first flash. Both of these mice came to the corn bait, which was about forty-three millimeters from the ground.

On the twenty-first mice came twice to the bait consisting of a little piece of raw lamb, with peanut butter on it. The distance from the ground to the top of this bait measured about forty-five millimeters. My first picture (fig. 5) that night was taken at about 8:30, and the second one (fig. 6) some time between nine o'clock and 6:30 the next morning, when I visited the trap. I found the peanut butter all eaten, but the meat apparently untouched. It was a rather raw, gloomy day, and when I removed the back from the metal case that serves to protect the camera from the weather, I found the spaces between the back of the camera and the case and the top of the camera and the case, well filled with dead leaves. They were stuffed all around the back part of the camera, making a nice little nest in which reposed a white-footed mouse. It lay snuggled up on top, with its tail hanging down over the back of the camera, but it did not hesitate to give up its comfortable bed when I stroked its soft fur and, scurrying out the front way, it ran several feet up a small sloping sapling, jumped to a handy grape vine, down to the ground and away.

Chicago, Illinois.





WHITE-FOOTED MOUSE

FIG. 1. The first one photographed of this series. August 1, 1927. FIG. 2. Photographed early in the evening of August 2, 1927. FIG. 3. First picture of the one-eared individual. August 3, 1927. FIG. 4. Second shot at corn bait. August 17, 1927. FIG. 5. Apparently investigating preparatory to sampling the bait. August 21, 1927. FIG. 6. Another picture taken on the night of August 21, 1927.

UNIV. OF MICH.

LOCAL CHANGE IN MIGRATION HABITS OF THE MULE DEER

By Winton Weydemeyer

A sudden and definite adaptation to a newly discovered condition of environment through the use of a new winter range has been made this year (1927) by the Rocky Mountain mule deer (*Odocoileus hemionus hemionus*) of eastern Lincoln County, Montana. The change of migration habits in this case not only demonstrates a quick reaction to a favorable living condition, but also credits this mammal with a very good memory.

The valley of the Tobacco River and its tributaries lies at an average elevation of approximately 3000 feet, in a western range of the Rocky Mountains thirty-five miles west of Glacier National Park. During the last twenty-five years the forests in this valley, untouched until then, have been largely logged off, and the area is now well dotted with farms and stump-ranches.

Throughout this entire period of change the habits of the deer in this locality have been noted by my father, and, since we became old enough to observe intelligently, by my brother and myself. The normal seasonal migrations of the mule deer have always been observed with interest. Remaining as high in the mountains as the depth of snow will permit during the winter, the deer descend in March to the valley, where later the fawns are born. During the summer they work back into the mountains, only a few stray individuals being left in the lowlands by October. Occasionally during November or December a lone buck passes through the valley from one mountain to another. As the snow on the high peaks and mountains far back in the ranges deepens, the deer migrate out to the lower ridges, but not into the valley, although the snow may reach a depth of four or five feet where they spend the winter.

This briefly describes the migration habits of the species from the time of first reliable knowledge of the valley, about 1900, until the fall of 1927. The earliest recorded date I have for the appearance of a mule deer in the valley in spring is February 2, 1921. At that time my father stated that he had never previously seen one down from the hills that early in the season. The doe and two fawns seen then were evidently strays, as no more were found in the valley until March 1. Meanwhile I observed several on nearby mountains.

In this valley during the present (1927) season the habit of wintering

in the mountains has been almost completely abandoned. On November 7 mule deer were already near the top of a 7400-foot mountain near the valley. Three days later I saw ten deer on the lower slopes of this mountain. On November 12 and 13 I found them numerous on a lower mountain, down to the very edge of the benchlands. At this time hundreds of shots were being fired at mule deer by hunters on all the low mountains and foothills, and the deer were all nervous and cautious, usually running for a mile or more upon being shot at. The hunting season ended November 15. By November 20 mule deer were quite common over the entire valley. On that date my brother and I walked to within fifty feet of a buck and seven does on an open hillside. For three or four days the deer had been pasturing in alfalfa fields around our farmstead, some approaching to within twenty feet of the house. (This sudden loss of fear has a plausible explanation. In the mountains every fall the deer are everywhere hunted. In the valley, because they have never before been there in that season, they have never been molested.) Before the end of November they fed from the alfalfa and from cabbage leaves in our garden at nearly all hours of the day, and became quite tame. We frequently walked half a mile through the adjoining woods and counted thirty-five or forty deer. At the present time (December 31, 1927) the snow on three acres of alfalfa around our house has been completely pawed over, and the plants have been gnawed down to the roots. Other stands of alfalfa and clover throughout the valley have been similarly treated. A week ago we were forced to construct a high woven-wire fence around a group of haystacks, as dozens of mule deer were eating their way into them day and night, paying no attention to the automobiles passing on the highway six rods distant.

It appears that this unprecedented fall migration to the valley has been made by practically all individuals of the species in this locality. Every week during the month of December I have made a trip over a group of low foothills beside the valley, in favorite mule deer territory, and have found the animals much less numerous than in the lower lands, and even outnumbered by white-tailed deer. On December 22 my brother and I climbed to an elevation of 7100 feet on one of the most "famous" mule deer mountains in this locality. On the lowest slopes quite a number of deer were staying, but even here they were not so plentiful as in the farming district below. Very few signs were seen above an elevation of 4500 feet. No deer were in the upper half of the normal wintering range on that mountain, although the snow was not deep.

No present condition can account for this sudden change in wintering range. Vegetation of practically all kinds has made a ranker growth this season than ever before since the valley has been known, and the browsing is good. Weather and snow conditions have not been unusual —in fact, most of the deer descended to the valley before winter really commenced. The change appears to be due only to a remembrance by the deer of the excellent grazing enjoyed in the valley last spring, and an instinctive desire to take advantage of the favorable environment. This requires an explanation.

The summer of 1926 was the driest ever known in this locality. Grass and other vegetation on the wintering grounds of the deer grew less abundantly than normally. Moreover, extensive forest fires burned over thousands of acres of this land. During the following winter snow lay deeper and for a greater length of time than usual in the mountains, and was crusted part of the time. This unusual combination of unfavorable conditions placed a great hardship upon the mule deer. When in March they made their usual migration down from the mountains, they were literally "mere bags of skin and bones." Ravenously hungry, by hundreds they scoured the valley in search of forage. Alfalfa, clover, and tame grasses, beginning an early growth, furnished the only good grazing obtainable, and at the scattered farms the deer gathered for miles around, to graze night after night from the constantly replenished supply of legumes and grasses. For forty-six days they pastured in our small meadows, as many as fifty-five together in an acre of alfalfa. Throughout the valley they took practically all their food from the farms, as in the woods very little grazing or browsing could be had. Becoming very tame, they paid no attention to automobiles passing close by, and would run but a few rods when fired at with shotguns by the unfortunate ranchers. Safe from harm by hunters, furnished with excellent and very easily obtainable food alongside unlimited forest cover, they found their new and necessary habits very acceptable.

During the summer the mule deer returned to their normal range in the mountains, but the remembrance of the alfalfa and clover fields, and of their starvation rations in the hills the winter before, it appears, led them to abandon their long-observed winter habits and descend to the valley. Those fields which furnished the most abundant feed in April and May were the first to be visited in November.

Whether or not this sudden and complete change of winter range will be permanent remains, of course, for future years to show. In any case, the new habits of this deer the present season must be considered very

unusual and interesting. Incidentally, if the damage done to farm crops last spring and this winter by the thousands of deer in this locality is repeated every year, this animal will become a decided detriment to successful farming.

Fortine, Montana.

ADDITIONAL NOTES ON THE LIFE HISTORY OF THE GOSS LEMMING MOUSE

By W. H. Burt

In 1924, the Goss lemming mouse was for the first time found in considerable numbers at Lawrence, Kansas. During the past two years while working in the University of Kansas Museum of Natural History under the direction of C. D. Bunker, I took the opportunity to study, in the laboratory as well as in the field, the habits of this animal. The relative lack of published information concerning its habits prompted the preparation of this account which, unless otherwise indicated, is limited to original sources of information. That is, no attempt is here made to summarize the scanty literature on this subject. A. B. Howell's recent paper (Revision of the American Lemming Mice, N. A. Fauna, no. 50, June 30, 1927) gives a bibliography of the more important papers containing references to the genus *Synaptomys*. As a source of life-history information, the article by Quick and Butler (Amer. Nat., vol. 19, pp. 113–118, 1885) might well have been included with Howell's bibliography of *Synaptomys*.

The first specimen of *Synaptomys cooperi gossii* (Coues) known to have been secured in Douglas County, Kansas, was that of a female, no. 1079, Univ. Kansas Mus. Nat. Hist., collected January 11, 1894, by E. D. Eames. Until found by the writer, this specimen had remained unrecognized among the specimens of *Microtus ochrogaster*. There is, unfortunately, no skull with the skin, but the short tail and characteristic pelage clearly distinguish it from *Microtus*. Although, as Linsdale points out (Notes on the Life History of *Synaptomys*, Journ. Mammalogy, vol. 8, pp. 51–54, 1927), from this early date on, mice had been collected extensively in that vicinity, none was again taken until the winter of 1924–1925, when he collected a number of them. Linsdale (*loc. cit.*) reports specimens from Neosho Falls, Topeka, Leavenworth, Manhattan and Lawrence, Kansas. More recently they have also

been taken in Atchison and Jackson counties, near Muscotah, Kansas, by R. A. Stirton, and near Garnett, Anderson County, Kansas, by T. E. White and the author. Most of the *Synaptomys* secured by the several collectors of the University of Kansas Museum have been taken in or near blue-grass associations where the grass had grown up from year to year and formed a thick mat that provided ideal feeding grounds as well as shelter. Seven miles southwest of Lawrence a number of *Synaptomys* were caught at the edge of a blue-grass patch near a creek where there was an undergrowth of grass of the genus *Setaria* among some dry weeds. Others were caught in a patch of blue grass on a north-facing slope near the top of a high hill one and one-half miles west of Lawrence. In wet weather this patch of grassland is decidedly

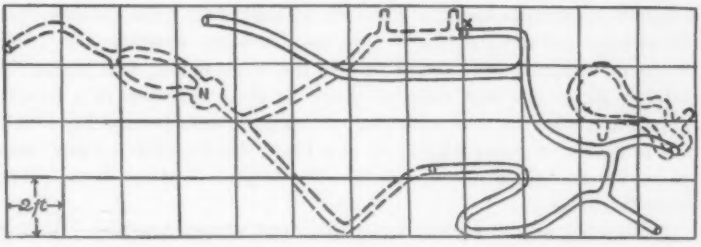


FIG. 1. PLAN OF A USED RUNWAY OF SYNAPTOMYS IN A PATCH OF BLUE GRASS SEVEN MILES SOUTHWEST OF LAWRENCE, KANSAS

Broken lines represent underground and solid lines surface runways. N, underground nest constructed of dry grass; x, entrance to underground runway where an adult female was caught.

"seepy" and a clump of willow trees grows at one edge. Near this place traps were set in dry grass, in weeds, and along fence rows, but only one specimen was caught away from the blue grass. This was an adult male caught February 26, 1926, in a runway through some dry weeds about one-fourth mile from any blue grass. On the previous night a specimen of *Microtus ochrogaster* was caught in the same trap and on the following night a specimen of *Cryptotis parva*. In several instances *Synaptomys* and *Microtus* were caught in the same runs.

The nests, which are from six to eight inches in diameter, are made of dry grass with, sometimes, a lining of fur. In winter the nests may be found from four to six inches below the surface of the ground, while in summer the mice often build above the ground. A round cavity

in which the nest is built is hollowed out in the runway. There are usually three or four exits from the nest, but it is not uncommon to find only two. A large nest built above the ground and constructed wholly of dry grass, that was found on October 30, 1925, was eight inches in diameter. The blue grass had grown up and fallen over, so that the nest was entirely concealed. There were five young in the nest. On returning the following day the young were found to be still in the nest, but on the third day they were gone. The parent had evidently removed them to another place when she learned that they had been molested. The diagram (Fig. 1) shows the position of one underground nest relative to the runways connected with it.

From one to seven young are brought forth in a litter. Pregnant females of this genus have been taken every month in the year. The numbers of embryos found at different seasons of the year indicate that the number per litter is less in cold than in warm weather. In 1925, young or embryos were found on the following dates: five young on October 30, in the nest mentioned above; three embryos in a female taken November 20; one embryo in a female taken January 21, which date fell within a very cold period. On December 20, 1926, a female was taken that contained four embryos. The weather had not been severe up to this time.

These mice remain active during the most severe weather. During the four days, January 21 to 24, 1925, eleven mice were caught despite the fact that this was an extremely cold period. The ground was covered with sleet and the temperature was four degrees below zero Fahrenheit on the morning of January 22. The only bait used was finely broken blue-grass blades.

The only food found in the runways was blue grass. In several instances small bundles of blue-grass blades from six to twelve inches long were found lying lengthwise in the runways. Near these bundles there often was a small pile of fresh feces. The food consisted almost wholly of blue grass as was shown by examination of eleven stomachs, taken at different times during the year, made by C. C. Sperry of the United States Biological Survey. The contents of each of nine of the stomachs examined was as follows: Condition of stomach, full; contents, finely chewed vegetation, probably grass, 100 per cent (parts of both leaf and stem present but no sign of seed or seed coat). A tenth stomach contained mycelial threads and spores of a fungus of the genus *Endogone*, 5 per cent, finely chewed vegetation, probably grass, 95 per cent (parts of both leaf and stem present, but no sign of seed or seed coat). The

eleventh stomach had a trace of animal matter, bits of a beetle (Haliplidae), finely chewed vegetation, probably grass, 100 per cent (parts of both leaf and stem present, but no sign of seed or seed coat). In several stomachs examined by the author only finely chewed vegetation, probably blue grass, was found.

The food of *Synaptomys* studied by the author was, in each case, chiefly blue grass, and consequently their excreta were green, whereas in all specimens of *Microtus* examined the excreta were brown or black. As was stated previously, the two forms are often found in the same associations. However, in eastern Kansas at least, it is usually necessary to examine a runway for only a short distance to determine the form occupying it. If large, plump, brown or black excreta are scattered along the runway, it is possibly occupied by *Microtus*, but if the excreta are smaller, more slender and green, and distributed in small piles, one can be almost certain that the runways are those of *Synaptomys*.

Several live specimens were brought into the laboratory and observations recorded on their habits in captivity. In securing these live mice, the following baits were used: apples, peanut butter, raisins, lettuce, and chopped up blue-grass blades. The blue grass and apples were most effective. A special cage was made so that the conditions were as near those in nature as possible. The cage was eight feet long, two and one-half feet wide and one foot deep. The top was covered with hail screen, except for a dark compartment in the center in which the mice could construct their nests if they so desired. A drum ten inches in diameter was placed at each end for the mice to exercise in and it was not long until the drums were kept in almost constant motion by the animals. The bottom of the cage was covered with thick blue-grass sod in which the mice made their runs.

The following foods were given the mice in captivity: blue-grass blades, blue-grass seed, lettuce, apples, sweet potatoes, potatoes, cabbage, peanut butter, raisins, green alfalfa, oats (seed), and clover seed. Cabbage and green alfalfa were not touched. Potatoes and sweet potatoes were eaten only sparingly. All the other mentioned foods were eaten, but blades and seeds of blue grass were preferred. Although the mice seldom, if ever, find some of these foods in nature, their consumption suggests the types of food that the mice might resort to in case there was a shortage of blue grass and other preferred natural food.

The lemming mice seem to be of a nervous temperament. Twice, pregnant females, that showed no signs of injury, were brought into the

laboratory only to die shortly after arriving. As a rule the mice are slow and cautious in their movements, but when frightened can move rapidly. They can be handled with ease and once in the hands show no signs of fear. Very seldom do they offer to bite the person holding them. While in captivity, they did not breed, probably due to their not being able to adjust themselves to the artificial environment. They showed signs of cannibalism; on June 7, a female was found dead in the cage with the skull broken, with bits of fur torn off and scattered about the cage, and with some of the flesh eaten from the skull. There were six other mice in the cage. Although they are chiefly nocturnal in their habits, it is not uncommon to see them running about in the daytime, either in the laboratory or in the field.

SUMMARY

In eastern Kansas, Goss lemming mice are almost always found in heavy blue-grass associations, probably because their principal food is blue grass. They are both diurnal and nocturnal in their habits. Nests are built of dry grass, both above and below the surface of the ground. They breed the year round and from one to seven young are brought forth in a litter. They are active all winter, even in the most severe weather. They are of a nervous temperament and when brought into the laboratory often seemingly worry themselves to death. Their habitat may be discerned, with a considerable degree of accuracy, by the presence of small, slender, green excreta and bundles of blue-grass blades in the runways.

Berkeley, California.

FOOD HABITS OF DEER MICE OF THE GENUS PEROMYSCUS IN CAPTIVITY

By Annetta Stow Cogshall

Previous investigators have reported that deer mice eat seeds, fruits, nuts, grains, grasses, and insects, but few definite identifications of the species eaten have been recorded. The following study reports observations on the kinds of food used by several forms of deer mice in captivity. The study was begun in the fall of 1926 and continued until the following June under the helpful guidance of Dr. Lee R. Dice. Dr. John Ehlers assisted in the identification of plants and Dr. Paul S. Welch and Jennings Hickman aided in insect identifications.

Four forms of deer mice were studied: *Peromyscus leucopus noveboracensis*, the white-footed mouse, was obtained in the vicinity of Ann Arbor, Michigan. The stock of *Peromyscus maniculatus bairdii*, the prairie deer mouse, was procured at Grafton, North Dakota. The stock of *Peromyscus maniculatus gracilis*, the Michigan deer mouse, was obtained at Elmira, Michigan. The stock of *Peromyscus maniculatus sonoriensis*, the Sonoran desert deer mouse, was originally obtained at Victorville, in the Mohave Desert, California.

The deer mice were kept in wire screen cages having a cotton nest provided as a place of retreat. The balanced ration supplied consisted of meals, dry meat-scraps, cod-liver oil, and other food materials. Especial care was taken that a sufficient food and water supply be provided so that the mice would never be forced into eating the test foods. One kind of food was fed at a time and occasionally the whole cage was inspected to determine the amount of food that was being stored. The number of specimens per cage ranged from two to a family of five, with an average of three. The amount of food supplied was in ratio to the number of mice in a cage.

All varieties of the deer mice studied ate the following seeds, fruits, and nuts:

Acer rubrum, red maple, seed
Acer saccharum, sugar maple, seed
Aesculus hippocastanum, horse chestnut
Ambrosia artemisiaefolia, ragweed, seed
Arctium minus, burdock, seed
Asclepias syriaca, milkweed, seed
Berberis thunbergii, Japanese barberry, seed and fruit
Carya ovata, hickory nut
Celastrus scandens, bittersweet, seed and fruit

Citrus sp., orange, seed and fruit
Crataegus sp., thorn-apple, seed and fruit
Cypripedium acaule, pink lady's slipper, seed and fruit
Cypripedium parviflorum, yellow lady's slipper, seed, and fruit
Dactylis glomerata, orchard grass, seed
Daucus carota, wild carrot, seed
Fragaria virginiana, strawberry, seed and fruit
Fagus grandifolia, beechnut
Gentiana sp., closed gentian, seed
Gerardia sp., gerardia, seed
Juglans cinerea, butternut
Juglans nigra, black walnut
Juniperus communis, juniper, seed
Lepidium virginicum, wild peppergrass, seed
Ligustrum vulgare, privet, seed and fruit
Lolium perenne, rye grass, seed
Lycopersicon esculentum, tomato, seed and fruit
Nepeta cataria, catnip seed
Phalaris canariensis, canary grass, seed
Picea abies, Norway spruce, seed
Picea canadensis, white spruce, seed
Plantago major, plantain, seed
Polygonum persicaria, smartweed, seed
Populus grandidentata, poplar, seed
Pyrus communis, pear, seed and fruit
Pyrus malus, apple, seed and fruit
Pyrus melanocarpa, chokeberry
Quercus borealis, oak, acorn
Rhus glabra, sumac, seed
Robinia pseudoacacia, black locust, seed
Rosa blanda, rose haw, seed and fruit
Rumex crispus, dock, seed
Smilacina racemosa, false spikenard, seed
Solanum nigrum, nightshade, seed and fruit
Solidago sp., goldenrod, seed
Symphoricarpos occidentalis, wolfberry, seed and fruit
Symphoricarpos racemosus, snowberry, seed and fruit
Taraxacum officinale, dandelion, seed
Vaccinium macrocarpon,cranberry, seed and fruit
Vaccinium corymbosum, high bush huckleberry, seed and fruit
Vaccinium canadense, low bush huckleberry, seed and fruit
Verbascum thapsus, mullein, seed
Verbena hastata, blue spike, seed

The deer mice ate most readily the seeds of red maple, sugar maple, milkweed, wild peppergrass, Norway spruce, and white spruce. They greedily ate the seeds and fruit of orange, thorn-apple, strawberry,

privet, tomato, pear, apple, chokeberry, wolfberry, snowberry, cranberry and huckleberry.

The parts of the seeds that were discarded include the outer shell of barberry, bittersweet, gerardia, lilac, maple, nasturtium, radish, ragweed, rye grass, sumac, timothy, water smartweed, and wheat; black locust pods; burdock burrs; flower petals; the fuzz of goldenrod seeds, dandelion, poplar catkins, and wild carrot; the silk of the milkweed pod; and the wings of the red maple, sugar maple, and spruce cone seeds. With the amarylis lily and dame's violet, the mice picked out the embryo from the seeds and cast away the rest of the fruit and flower.

Among the fruits stored were the snowberry, wolfberry, apple, pear, and thorn-apple. The deer mice ate the pulp and seeds of these fruits greedily and discarded the skin.

They stored most of the nuts and discarded the shells. If after persistent gnawing they were unable to penetrate the hard shell of a hickory nut or walnut, they would store the nut and attempt it later. They gnawed at both ends of a hickory nut, but did not quite succeed in penetrating the shell until it was slightly cracked for them and then they opened it and ate the nut-meat greedily. The deer mice were especially fond of acorns, horse chestnuts, and beechnuts, for they could easily get through the shell of these. That they are able to penetrate hard surfaces is shown by their gnawing through an olive pit in several places.

The mice ate the seeds of the following cultivated plants: alfalfa, army bean, barley, cabbage, China aster, corn, dame's violet (*Hesperis*), garden pea, lilac, millet, nasturtium, oat, peanut, radish, rape, red amarylis lily, red clover, timothy, and wheat.

The following cultivated plants were eaten readily by all of the mice: carrot roots, celery tops, dandelion greens, lettuce leaves, narcissus leaves and bulbs, and spinach leaves.

They discarded the outer coat of chaff from the oats and stored them and some other grains for future use. *Peromyscus maniculatus gracilis* was observed to carry as many as ten kernels of wheat in its cheek-pouches at one time. When the cage was later inspected, it was found that the mice had eaten part of the grain stored previously.

Millet, rye-grass, beans, and wheat were planted and placed in the cages. Immediately the mice dug up the seeds and ate them. Then another planting of the same seeds was made and sprouted. These were placed in the cages and the mice greedily ate the shoots.

All the mice readily ate the buds and bark of the following trees and shrubs:

Acer negundo, box elder
Acer rubrum, red maple
Acer saccharum, sugar maple
Cornus florida, flowering dogwood
Juniperus communis, juniper
Populus deltoides, cottonwood
Prunus sp., cherry
Pyrus malus, apple
Salix discolor, pussy willow
Salix nigra, willow
Syringa vulgaris, lilac
Tilia americana, basswood
Ulmus americanus, elm
Vaccinium canadense, low bush huckleberry
Vaccinium corymbosum, high bush huckleberry

All the mice ate the buds and the bark of the twigs readily, but not the wood, preferring pussy willow, maple, apple, and cherry. They later stored the uneaten twigs. They ate a very little of the bark of *Pinus sylvestris*, nibbling only slightly also at the needles, bark, and buds.

The following insects and other animals were eaten:

Arachnid, unidentified small land spider
Ambystoma maculatum, spotted salamander eggs
Brachinus sp., bombardier beetle
Calosoma sp., ground beetle and pupa
Cambarus virilis, crayfish
Coccinella novemnota, lady-bug
?*Culex* sp., mosquito and larvae
?*Cylisticus convexus*, sow-bug
Diptera, unidentified fly
Dytiscus sp., small water beetle
Formica sp., large black ant
Glischrohius fasciatus, carrion beetle
Heldrilus sp., earthworm
Isa isabella, woolly bear moth pupa
Lepidopteran, unidentified moth
Millipeda sp., millipede
Orchelinum vulgare, grasshopper
Periplaneta americana, cockroach
Rana pipiens, leopard frog eggs
Slug

They discarded the crayfish appendages and outer shell, also the jelly around the amphibian eggs, and the slimy covering of the slug. In addition the mice discarded the legs, head, and skin of the beetles, grasshoppers, sowbugs and spiders; the wings of moths, flies, and mosquitoes; and the pupal cases of the woolly bear moth and ground beetle. They ate greedily all kinds of insects fed them, and captured flies and moths while the insects were in flight.

In their natural habitats, forest deer mice are undoubtably of value in helping to control the harmful insects that attack forest trees; while prairie deer mice are probably beneficial in destroying some destructive insects found in cultivated areas. On the other hand, these mice may sometimes destroy planted seeds or newly sprouted plants, as indicated by their greediness for these in captivity. At times the forest deer mice might damage the buds or bark of orchard or forest trees, but no serious damage caused by these mice has yet been reported.

So far as is known, all forms of deer mice live on the same general sorts of food, namely, grains, seeds, fruits, and insects, and in captivity thrive on the same balanced ration. In observing deer mice, I found that *Peromyscus maniculatus bairdii*, the prairie form, ate sprouting grains, lettuce, and narcissus leaves and bulbs more readily than the others, and discarded only the thin outer layer of bran from the grains. *Peromyscus maniculatus gracilis* and *Peromyscus leucopus noveboracensis*, both forest forms, ate more bark from the twigs, ate the buds more greedily, discarded a thicker outer layer from the grains, and ate spruce seeds and nuts the most readily of any of the species studied. *Peromyscus maniculatus sonoriensis*, the desert form, ate of every variety of test food more readily than the other species, probably because they were not as shy as the others and consequently were more easily observed. All the forms ate sumac berries (*Rhus glabra*), thus failing to support Hahn's[1] statement to the contrary. No food was completely refused.

The results of this study have shown that food is probably not an important factor in limiting the habitat distribution of the different species of deer mice. Regardless of the wide variation of range inhabited by the forest, prairie, and desert forms of *Peromyscus* observed, all readily ate the same sorts of food with only slight differences in food preferences.

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[1] Hahn, Walter Louis. Mammals of Indiana. 33rd Ann. Rep. Dept. Geol. and Nat. Res. Indiana, p. 496. 1909.

THE MAMMAL FAUNA OF SAKHALIN

By Nagamichi Kuroda, M.A.S.M.

The principal papers on the mammals of Sakhalin were published by Schrenck (1859), Nikolsky (1889), Dobson (1890), Thomas (1907), and Murata (1914). H. Orii, the collector, obtained 15 species and subspecies of mammals on that island during the years 1926 and 1927. I have been able to add one subspecies to those hitherto known from Sakhalin, bringing the total number of forms to 35. All the known mammals of that island are listed and noted below.

SORICIDAE

1. Sorex daphaenodon daphaenodon Thomas.—Thomas described it from Dariné, 25 miles northwest of Korsakoff, Sakhalin. Mr. Orii, however, failed to obtain a specimen.

2. Sorex daphaenodon yesoensis Kishida.—A specimen (♀) was obtained by Mr. Orii at Nayoro, Tomarioro, Sakhalin, May 18, 1926. It measures as follows: Head and body, 71; tail 35; hind foot, 13; ear, 5.5 mm. This shrew was recorded only from the Prov. Nemuro, Hokkaido, and it has larger head and body than *daphaenodon* from Sakhalin.

The original description by Kishida (Monogr. Japanese Mamm., 1924, p. 81, in Japanese) states that *yesoensis* resembles *daphaenodon*, but head and body larger (82 mm. instead of 59 mm.), without hairs at tip of tail, and in having the teeth less stained with red. My specimen from Sakhalin, before me, has also very short hairs at tip of tail and is larger than *daphaenodon*. It is probably identifiable with *yesoensis* rather than *daphaenodon*. If my identification is right, this is apparently the first record of *yesoensis* from Sakhalin.

3. Sorex minutus gracillimus Thomas.—Mr. Orii obtained a female of this very rare form at Nakasato, Ôtomari, Sakhalin, May 19, 1926. It measures as follows: Head and body, 44; tail, 41; hind foot, 11; ear, 4 mm. It is undoubtedly the second specimen of this tiny and rare animal from this island. Skull damaged.

Anderson obtained a female, the type specimen, at Dariné, 25 miles northwest of Korsakoff, Sakhalin. It was described by Thomas from the skull and one hind foot with measurements taken from fresh specimen. The rest of body was unfortunately stolen by a rat.

4. Sorex shinto saevus Thomas.—Thirteen specimens were procured by Mr. Orii at Nayoro, Tomarioro (May 25 to June 8, 1926), Niitoi, Tomarikishi, Shikka (October 26 and 29, 1926), Sakaihama (November 9 to 18, 1926), and Nakasato, Ôtomari (December 18 and 30, 1926), all in Sakhalin. Anderson obtained it near Korsakoff (type locality), Sakhalin, and Hokkaido (Thomas).

5. Sorex unguiculatus Dobson.—Fourteen specimens were collected at Nayoro, Tomarioro (May 11 to 17, 1926), Nokkoro, Chirie (September 15, 1926), Sakaihama (November 7 to 18, 1926), and Nakasato, Ôtomari (December 4 to 19, 1926), all in Sakhalin. Schrenck discovered it on Sakhalin and it was described by Dobson (1890). Thomas reported it from Sakhalin and Hokkaido. I have also a series from both islands.

VESPERTILIONIDAE

6. Myotis daubentonii ussuriensis Ognev.—Ognev described it from near Vladivostok and reported it also from Sakhalin (Journ. Mamm., vol. 8, 1927, pp. 146–147).

7. Myotis mystacinus gracilis Ognev.—Mr. Orii obtained two specimens (♂ and ♀) at Nokkoro, Chirie, Sakhalin, July 29 and September 18, 1926. These specimens, ♂ and ♀ respectively, measure: Head and body, 49, 43; tail, 36, 40; hind foot, 10, 10; ear, 13, 14; forearm, 35, 34 mm.

The female collected has its back uniformly dark brown, but the male has buffy tips to the hairs. The fur of under surface of body of both specimens has distinctly paler tips than in the upper surface. The membrane is inserted at the base of outer toe, as mentioned by Ognev. Ognev described it from near Vladivostok and reported it also from Sakhalin (*l. c.*, pp. 145, 150).

I have two other specimens of this bat from Chinominoji, Kunashiri Island, South Kuriles, collected September 17 and 26, 1907, by Mr. Orii. These are probably new records for the bat from South Kuriles.

8. Plecotus auritus ognevi Kishida.—Kishida reported it from North Sakhalin. Ognev reported it from Sakhalin, Ussuri, Amur, and Transbaikalia under the name of "*sacrimontis*," but the latter name should be used for the Japanese form only. (*cf.* Kishida, "Dôbutsu. Zasshi," 1927, p. 418.) I have a specimen of this form from Etrup, North Kuriles, September 4, 1907.

LEPORIDAE

9. Lepus timidus orii subsp. nov.—Mr. Orii obtained four adult specimens with two embryonal young at Nayoro, Tomarioro, Sakhalin, April 29 and May 6, 1926. Another specimen (♀ ad.) from mouth of R. Susuya, Sakhalin, May 16, year unknown.

TABLE 1

External measurements of Lepus timidus orii

NUMBER	SEX	LOCALITY	DATE	HEAD AND BODY	TAIL	HIND FOOT	EAR
				mm.	*mm.*	*mm.*	*mm.*
660	♀ ad.	Mouth of R. Susuya	May 16, (year?)			163	86
1229	♂ ad.	Nayoro, Tomarioro	April 29, 1926	515	53	156	87
1230	♀ ad.	Nayoro, Tomarioro	April 29, 1926	515	55	165	82
1233	♀ ad.	Nayoro, Tomarioro	June 6, 1926	594	56	157	86
1234 Type	♂ ad.	Nayoro, Tomarioro	June 6, 1926	588		155	80

Diagnosis.—Summer pelage: Near to *Lepus timidus gichiganus* Allen, but distinguishable from it by the front, crown, and sides of head being pale russet brown or rufous instead of gray-brown; back, rump, sides of body and thighs grayish brown or rufous brown instead of clear dark gray as in *gichiganus;* extreme

rump somewhat grayer or blackish. Tail and hind foot on an average shorter, but ear distinctly longer. Skull larger, especially the total length averaging longer; the greatest length of zygomatic breadth broader, 49.9 to 52 mm. instead of 45 to 50 mm.; postorbital constriction narrower, 13.5 to 16 mm. instead of reaching to 19 mm. as in *gichiganus;* length of lower jaw longer; and height of lower jaw also higher. It also differs from *L. timidus ainu* in having the tail shorter and ear longer, 80 to 87 mm. instead of 76 to 80 mm. Skull varies, and is very similar to that of *ainu* in measurements and structure.

Type.—Adult male in summer pelage, Nayoro, Tomarioro, Sakhalin, May 6, 1926. N. Kuroda collection no. 1234. H. Orii collector.

Schrenck (1859) reported it from Sakhalin under the name of *Lepus variabilis.* Thomas (1907) noted it as *L. timidus.* Aoki (1913) and Murata (1914) both recorded it as *L. t. timidus,* and Kishida (1924) mentioned it as "*L. gichiganus* subsp.?" From my recent examination it is clear that the Sakhalin hare is very

TABLE 2

Cranial measurements of Lepus timidus orii

NUMBER	UPPER LENGTH	BASAL LENGTH EXCLUDING INCISOR	GREATEST ZYGOMATIC BREADTH	MASTOID BREADTH	POSTORBITAL CONSTRICTION	LENGTH OF NASALS	BREADTH OF NASALS AT BASE	LENGTH OF UPPER MOLAR SERIES (ON ALVEOLAR LINE)	LENGTH OF LOWER JAW EXCLUDING INCISOR	HEIGHT OF LOWER JAW
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
660	100	80.5	51	37.1		46	21	17	80	53.1
1229	94.5	76	51.5	36	16.5	40.1	21.5	17.9	74.5	48.5
1230	94.5+	76	49.9	32	15	39+	20.5	18	76.5	49.5
1233	97.2	77.5	52	34.1	16	41.5	20.5	17.5	75	50
1234 Type	99.5	79	50	32.1	13.5	42.1	20.1	19	77.5	51.5

similar to *ainu* of Hokkaido rather than to *gichiganus* of Gichiga, west coast of Okhotsk Sea, and the new form should be recognized as one of the subspecies of *timidus,* as already considered by Thomas, and not of *gichiganus* which seems also a subspecies of *timidus.*

SCIURIDAE[1]

10. Sciurus vulgaris rupestris Thomas.—K. Tago presented to me a fine series of skins of this form that were collected in several localities on Sakhalin in several seasons. Thomas described it from Sakhalin.

11. Eutamias asiaticus uthensis (Pallas).—Mr. Orii collected two females at

[1] Schrenck (1859) reported *Castor fiber* L. from Sakhalin as follows: "Dasselbe dürfte auch für die Insel Sachalin gelten." But I have omitted it from this list, for no skin of this animal was obtained by collectors.

Nayoro, Tomarioro, Sakhalin, June 2, 1926. Thomas recorded it from the island.

12. Pteromys russicus athene (Thomas).—Mr. Orii obtained a broken skull apparently of this animal from a stomach of the Ural owl (*Strix uralensis ?tatibanai*) that was shot by him at Nakasato, Ôtomari, Sahkalin, March 5, 1927. Thomas described the subspecies from the same island.

MURIDAE

13. Evotomys amurensis amurensis (Schrenck).—Mr. Orii collected 24 specimens at Nayoro, Tomarioro (May 12 to 17, 1926), Chirie (August 5 and 17, 1926), Niitoi, Tomarikishi, Shikka (October 22 to November 1, 1926), Sakaihama (November 12 to 20, 1926), and Nakasato, Ôtomari (December 20 and 21, 1926), all in Sakhalin. Thomas reported it from the same island.

14. Craseomys bedfordiae (Thomas).—Mr. Orii brought back a skull from Sakhalin. Thomas described it from Hokkaido and reported it also from Sakhalin.

15. Apodemus geisha hokkaidi (Thomas).—It was described by Thomas from Hokkaido and reported from Sakhalin. My collector, however, failed to find it on the latter island.

16. Apodemus speciosus giliacus (Thomas).—Mr. Orii obtained five specimens from Niitoi, Tomarikishi, Shikka (October 28, 1926) and Sakaihama (November 8 to 17, 1926), all in Sakhalin. All these specimens before me have smaller dimensions, which are shown below.

SEX	HEAD AND BODY	TAIL	HIND FOOT	EAR
♂	89	91	24	15
♂	95	94	23	12
♂	93	94	23	14
?	87	95	23.5	13
♂			23.5	

They are probably somewhat younger than Thomas's specimens which have much larger body (H. & B., 102 to 104 mm.) and longer tail (108 to 113 mm.). But the length of hind feet does not differ from that of my specimens.

ZAPODIDAE

17. Sicista caudata Thomas.—Only recorded from Sakhalin by Thomas. It seems to be a very rare animal.

FELIDAE

18. Lynx lynx borealis Thunberg.—I have examined a mounted specimen that was killed by a motor car on Sakhalin, date unknown. It is now preserved in the Sakhalin Government. This specimen measured by me as follows: Head and body, 950; tail, excluding hairs, 205; hind foot, 200; ear, excluding hairs, 67; length of hairs at tip of ear, 48 (right), 54 (left); height at shoulder, 480; length of claw of fore thumb, 27.5 mm.

General color of fur very pale, possibly due to exposure to light for some length

of time. Ground color of back grayish white with some black hairs; under fur dark cinnamon; crown, front and sides of muzzle with indistinct brown spots and longitudinal lines; middle of back darker; back of ear similar to back in color and edges of ear brownish black; hairs at tip of ear long and dark reddish brown, intermingled with some white hairs; hairs of hind part of cheeks also long and tufted and inside of this tuft with a black patch; underparts from chin to abdomen uniformly white with dark reddish brown long hairs, making spots on chest and abdomen; fore limbs similar in color to back, but with indistinct cinnamon brown spots; spots on hind limbs more obscure; upperparts of tail like the back with dark reddish brown-black patch at tip; underside of tail much paler; sides of body with woolly white hairs; claws of limbs sharp and horny white in color; claw of fore thumb largest and longest.

Schrenck reported it from Sakhalin. Messrs. Murata and Kishida also included this animal as a member of the Sakhalin mammal fauna. It seems probable that it is becoming very rare on the island.

19. Felis uncia Schreber.[2]—Schrenck (1859) and Kishida (1924) recorded it from Sakhalin. It seems to be a rare animal on that island.

CANIDAE

20. Cuon alpinus (Pallas).—Schrenck reported it from Sakhalin and Kishida also mentioned it from the same island. This Siberian wild dog has its tooth-formula as follows: i $\frac{3}{3}$, c $\frac{1}{1}$, pm $\frac{4}{4}$, m $\frac{2}{2}$ = 40.

21. Canis lupus lupus Linnaeus.—Schrenck recorded it from Sakhalin. Aoki and Kishida both reported it from this island and Hokkaido (rare). The wolf has the following tooth-formula: i $\frac{3}{3}$, c $\frac{1}{1}$, pm $\frac{4}{4}$, m $\frac{2}{3}$ = 42.

22. Vulpes anadyrensis schrencki Kishida.—Mr. Orii collected an adult male in summer pelage at Kita-Shiretokosaki, Chirie, Sakhalin, July 11, 1926, and he brought back a skull of young female with dimensions of body, which was obtained at Nakasato, Ōtomari, Sakhalin, February 6, 1927. The specimens, adult ♂ and juv. ♀, respectively, measure: Head and body, 780, 645; tail, 440, 380; hind foot, 178, 165; ear, 92, 82; total length of skull excluding incisor, 154, 149.5; basilar length of skull excluding incisor, 142, 134.5; zygomatic breadth, 86, 77; length of nasals, 58.5, 59.5; length of lower jaw excluding incisors, 117.5, 111.

The original description of Kishida (Monogr. Japanese Mamm., 1924, p. 251, in Japanese) states that this subspecies is distinguished from the continental red fox (*anadyrensis*) in having the crown of head not paler than back and shoulders, underparts white with a reddish brown wash instead of brownish-red, and the white apical patch of tail not greater in area. It is undoubtedly a color race and probably confined to Sakhalin from where Kishida described it. Doubtfully recorded from Hokkaido by the same author.

URSIDAE

23. Ursus arctos collaris Cuvier.—Murata (1914) and Kishida (1924) both recorded it from Sakhalin.

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[2] Schrenck (1859, pp. 95–96) reported *Felis tigris* from Sakhalin as a rare winter visitor from continent, but his statement seems very doubtful.

MUSTELIDAE

24. Mustela erminea kanei (Baird).—Mr. Orii obtained an adult male in summer pelage at Chirie, Sakhalin, July 21, 1926. It measures as follows: Head and body, 235; tail, 88; hind foot, 46; ear, 20.5; greatest length of skull, 45; basilar length, 40.5; zygomatic breadth, 24.6. Schrenck, Aoki and Murata reported it from Sakhalin.

25. Mustela rixosa (Bangs) *subsp.*?—Murata (1914) recorded "*Mustela vulgaris* Briss." from Sakhalin, but I have not examined any specimen from that island. In Hokkaido and North Hondo, Japan, we have a subspecies, *M. rixosa namiyei* Kuroda, so that the Sakhalin form seems to be the same species as is found in Hokkaido and North Hondo, and not of the "*vulgaris*" = *nivalis* group.

26. Martes zibellina sahalinensis Ognev—Mr. Orii brought back two skulls from Nosamu, Sakaihama, Sakhalin, March 18, 1927. They measure, male and female?, respectively, as follows: Total length excluding incisor, 84, 77.5; basilar length excluding incisor, 74.2, 68.1; zygomatic breadth, 44, 42.9; mastoid breadth, 22, 20.5; postorbital constriction, 17, 15.5. Schrenck, Murata, and Kishida recorded it from Sakhalin under the name of *Martes zibellina*. Ognev described it from Wedernikovo, Sakhalin (Journ. Mamm., vol. 6, 1925, p. 279).

27. Gulo gulo (Linnaeus).—I have examined a mounted specimen of this mammal killed on Sakhalin and now preserved in the Sakhalin Government, date unknown. This example measured by me is as follows: Head and body, 820; tail, 165; hind foot, 150; ear, 34 mm. (taken from the mounted specimen).

From crown of head to occiput buff; frontal band very indistinct, and the border between front and crown not defined; mantle yellowish brown, and next to mantle an indistinct buffy transverse band; rump dark brown; underparts dark blackish chestnut with pale chestnut throat which has a white spot; chest with two large white patches; abdomen with small yellowish white spots; tip of muzzle dark brown; lower half of limbs dark blackish chestnut like the underparts; soles with very long hairs, tipped with pale chestnut-white; claws yellowish horny color with brown bases; tail blackish chestnut; a pale band from base of fore limbs to hind part of body buffy white; inside of ear dark brown and outer side of it buff.

Schrenck and Kishida reported it from the island. It is also a rare animal on Sakhalin.

28. Lutra lutra lutra (Linnaeus).—Murata recorded it from Sakhalin, and stated that examples from this island have very good pelage like those from the Kuriles and Hokkaido.

OTARIIDAE

29. Eumetopias jubata (Steller).—Murata stated that it is found on both coasts of Sahkalin. Kishida also reported it from that island.

30. Callotaria ursina (Linnaeus).—I have examined a young specimen from Robben Island, belonging to Sakhalin, August, 1926. It measures as follows: Head and body, 850; tail, 32; ear, 30; bar part of fore flipper, 155; hind flipper from base of tail, 243 mm. (taken from the mounted specimen). Murata, Doi, and Kishida recorded it from Sakhalin.

PHOCIDAE

31. Phoca barbata Fabricius.—Kishida reported it from Sakhalin.

32. Phoca largha Pallas.—I have examined three mounted specimens, one adult and two juveniles, from Shikka, Sakhalin, May 25, 1926. The adult measures as follows (from the mounted specimen): Total length with stretched foot, 1,370; distance between eyes, 73.5; hind flipper from root of tail, 211; tail without hairs. The two juveniles measure in total length with stretched foot 790 and 765.

General color yellowish-white with dark dorsal line; back with dark brown spots margined with yellowish white; sides with indistinct pale chestnut spots; these spots more distinct in young specimens than in adult; claws blackish brown; beard yellowish white, wavy.

Murata reported this seal under the name of *Phoca vitulina* from mouths of rivers at Sakaihama where it was not uncommon. Kishida also reported it from this island.

CERVIDAE

33. Rangifer tarandus ?sibiricus (Schreber).—Mr. Orii brought back three pairs of antlers from Chirie, Sakhalin, February, 1925. Schrenck, Murata, and Kishida reported it from the island.

The subspecific name of the Sakhalin example is not clearly identified, but Kishida considers that the animal probably belongs to the Siberian form, *sibiricus*, rather than to the Kamtschatkan, *phylarchus*.

34. Moschus moschiferus moschiferus Linnaeus.—I have examined a female (mounted specimen) from Sakhalin which is preserved in the Sakhalin Government. It measures (taken from the mounted specimen): Head and body, 830; height at shoulder, 500; ear, 70 mm. Upper surface pale cinnamon brown (somewhat exposed to light) with indistinct white markings; underparts and inside of limbs paler; inside of ear whitish; a white mental patch; sides of fore-neck with longitudinal white spots.

Shrenck, Murata and Kishida reported it from the island, where it seems to be rare.

RHACHIANECTIDAE

35. Rhachianectes glaucus Cope.—Tago (1922) reported that the California gray whale migrates to the east coast of Sakhalin.

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DIDELPHIIDAE FROM THE LANCE BEDS OF WYOMING

BY LORIS S. RUSSELL

In 1895 the late J. B. Hatcher, at that time associated with Princeton University, made a collection of small vertebrate fossils from the "Laramie" beds of Lance Creek, Niobrara County, Wyoming. During the last year Prof. W. J. Sinclair turned this material over to me for examination. While the mammalian remains are very similar to those described by Marsh from the same locality, there are several didelphiid specimens that are worthy of special notice. These are the subject of the present communication.

Genus *Pediomys* Marsh

Marsh, O. C., Amer. Journ. Sci., vol. 38, p. 89, pl. 4, figs. 23–25, 1889; Simpson, G. G., Amer. Journ. Sci., vol. 14, p. 124, 1927.

Pediomys hatcheri (Osborn)

Protolambda hatcheri, Osborn, H. F., Bull. Amer. Mus. Nat. Hist., vol. 10, p. 172, fig. 1A, 1898.

Simpson refers to the genus *Pediomys* the Lance upper molars of more typical didelphiid structure. While these appear different from the type of *Pediomys elegans* Marsh, the latter is probably the corresponding last molar. Osborn[1] has figured teeth of *Pediomys*, but the originals of his figure A were regarded by him as generically distinct, and later were given the name *Protolambda hatcheri*.

[1] Osborn, H. F., Bull. Amer. Mus. Nat. Hist., vol. 5, pl. 8, figs. A, B, 1893.

In the Princeton collection there is a perfect right M^2 (fig. 1), from "quarry 1," that agrees in detail with the types of *Protolambda*. This specimen is in place on a fragment of the maxilla, and confirms Simpson's statement that the *Protolambda* teeth were reversely orientated by Osborn. The alveoli of M^3 are present and indicate a tooth wider than the M^2. The inner edge of the maxilla fragment appears to be the margin of the posterior palatine vacuity, and if so, this opening was proportionately closer to the inner alveoli than is usual in the opossum.

FIG. 1. PEDIOMYS HATCHERI (OSBORN). FRAGMENT OF RIGHT MAXILLA, WITH M^2. ×2

Genus *Delphodon* Simpson

Simpson, G. G., Amer. Journ. Sci., vol. 14, p. 127, 1927.

Simpson bases this genus on lower molars having a low trigonid with subequal cusps. For the present discussion the type species *Delphodon* (*Didelphodon*) *comptus* (Marsh)[2] may be distinguished by the character of the paraconid, which inclines forward from the metaconid, and is completely anterior to the protoconid.

FIG. 2. DELPHODON? PRAENUNTIUS N.SP. RIGHT LOWER MOLAR
A, external view. B, superior view. ×2

Delphodon? praenuntius sp. nov. (fig. 2)

Type.—Right lower molar (Cat. No. 11369, Geol. Mus., Princeton Univ.); from "quarry 1," Lance Creek, Wyoming; collected by J. B. Hatcher.

Specific characters.—Lower molars with moderately high trigonid; protoconid highest; paraconid and metaconid smaller, subequal, close together; length of tooth = 4.6 mm. or less.

[2] Marsh, O. C., Amer. Journ. Sci., vol. 38, p. 88, pl. 4, figs. 5–7, 20–22, 1889.

Remarks.—These teeth probably represent a separate genus, but they are not satisfactory material for a generic diagnosis. By separating them as a species we distinguish a very important type of lower molar. Such teeth are numerous in the Princeton collection, and represent the nearest approach, among the lower molars of the Lance, to the modern *Didelphis*. The latter fact suggests their correlation with the *Pediomys hatcheri* upper molars, as does the excellent occlusion that may be obtained between examples of each.

FIG. 3. DIDELPHIID. FRAGMENT OF SUPRA-OCCIPITAL AND PARIETALS

A, external (superior) view. B, internal view. *ldl*, lambdoidal crest; *sg*, sagittal crest. ×1.

The lower molars referred by Marsh[3] to *Batodon tenuis* possess the characters of the present species.

Didelphiidae, incertae sedis

Two fragments from the posterior part of the cranium are included in the Princeton Collection. As the skulls of Lance mammals are almost

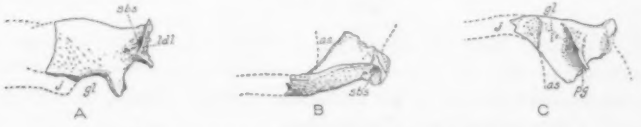

FIG. 4. DIDELPHIID. FRAGMENT OF LEFT SQUAMOSAL

A, external view. B, superior view. C, inferior view. *as*, position of alisphenoid; *gl*, glenoid cavity; *j*, position of jugal; *ldl*, lambdoidal crest; *pg*, postglenoid and postzygomatic foramina; *sbs*, subsquamosal foramen. ×1.

unknown, these specimens are described in some detail. In general, they resemble the corresponding parts in *Didelphis*. Although not from the same skull, they appear to pertain to closely related forms.

The first specimen (fig. 3) is a median fragment from the postero-superior region of the brain case. Although the sutures are obliterated,

[3] Marsh, O. C., Amer. Journ. Sci., vol. 43, p. 258, pl. 10, fig. 6, 1892.

it apparently includes portions of the supraoccipital and both parietals. It indicates a skull considerably smaller than that of *Didelphis virginiana*. The sagittal crest is a low straight ridge, but the lambdoidal crest is well developed. Internally the most marked feature is the extreme shallowness of the cerebellar fossa, which is separated off by the merest indications of a tentorium. The antero-posterior width of the fossa is further decreased medially by a low protuberance near the posterior margin of the bone.

The second fragment (fig. 4) consists of a portion of the left squamosal. This also bears a prominent lambdoidal crest. The most striking feature is seen in the superior margin of the zygomatic process, which continues as a sharp, free edge back to the lambdoidal crest, and is thus quite free from the cranial portion of the squamosal. This indicates that the zygomatic process, with the glenoid cavity, projected lateral to the cranium to even a greater extent than is the case in *Didelphis*. The glenoid cavity is very similar to that of the opossum. The postglenoid and postzygomatic foramina are indicated, the small postzygomatic running forward from within the aperture of the postglenoid. This is the typical didelphiid relationship. The postglenoid communicates with the subsquamosal foramen, which here opens upward and outward, and is separated from the postglenoid area by a distinct, rounded ridge. This arrangement is characteristic of the living *Dasyurus*. Anterior to the subsquamosal foramen is another, much smaller, opening.

CONCLUSIONS

It is evident from the foregoing descriptions and figures that the marsupials of the upper Cretaceous included animals which differed only in details from the living *Didelphis*. Some of these, at least, also possessed characters of the Dasyuridae.

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TWO NEW CARNIVORES FROM THE PLIOCENE OF KANSAS

By Handel T. Martin

[*Plates 20–21*]

In the collection procured during the past two years from the Pliocene deposits in Kansas by the University of Kansas department of vertebrate palaeontology are two interesting, seemingly new, carnivores, *Brachypsalis* and *Hyaenognathus*, preliminary descriptions of which it seems desirable to place on record, inasmuch as the report on the entire collection will not appear for an indefinite time.

The *Brachypsalis* here called *marshalli* is so named in honor of Abram Marshall of Lincoln, Kansas, on whose ranch in Sherman County, Kansas, the specimen was found, and who generously granted permission to collect there.

Brachypsalis marshalli new species

Type.—No. 3464, Univ. Kansas Mus. Vert. Paleon.; right mandibular ramus, with P_2, P_4, and M_1; coronoid process and part of outer wall of alveolus of canine missing; right and left auditory bullae (much broken) with attached zygomatic roots of squamosal bones and glenoid fossae; and left exoccipital condyle.

Locality.—Fifteen miles south of the small railroad town of Edson, Sherman County, Kansas.

Referred material.—No. 3465, P^4 and M^1, with adjacent part of maxilla; no. 3469, right upper canine; and no. 3467, right mandibular ramus of a young individual with milk molars lower—3 and 4, and showing the just emerging crown of permanent M_1 and M_2.

Description.—Although the skull parts and the upper teeth were not found in close proximity to the lower jaw, they were all within a radius of twelve to fifteen square feet in the loose sandy matrix, and there is little doubt but that they all belong to the same individual. The condyle of the jaw fits exactly into the glenoid cavity, and the upper and lower teeth occlude perfectly. Thus, numbers 3465, 3467, and 3469, mentioned in the referred material, may with little doubt be referred to the individual represented by the parts designated as the type.

The lower jaw and, indeed, all the associated parts are stoutly built, and indicate an animal of great strength. The specimen is about one-ninth larger than *Brachypsalis modicus* Matthew from the Snake Creek beds of Nebraska. The dentition, shape of jaw, and general appearances suggest its close relation with the wolverine.

As in the wolverine, the long, rather slender condyle of the lower jaw locks firmly in place in the glenoid fossa, and is held there by a strong backward curving glenoid process, so that it is impossible to remove the jaws from the skull except by breaking them apart at the symphysis, and sliding them out sideways, exactly as one must do with the wolverine jaw. The symphysis of the jaw is both long and wide, and deeply sculptured. The masseteric fossa is deep and wide.

The canine, judging from the alveolus, must have been of great size, and flattened laterally. It measures one-fourth larger than the canine of *Aelurodon*, and is so large as to appear to be out of proportion to the other teeth.

The premolars are not greatly crowded, and a short diastema exists between P_2 and P_3. The heel of P_4 slightly overlaps the anterior base of the first molar.

The incisors are crowded out of line, are deep and narrow, deeply rooted, but the smallest of them is larger than the largest one in *Aelurodon*. I_2 is large, deep, and narrow anteriorly and broad posteriorly. I_3 is strong, deeply rooted, broad anteriorly and narrow posteriorly, the alveolus is set obliquely to the long axis of the jaw.

The mental foramen is directly below the posterior root of P_3. P_3 is bigger and stronger than in *Aelurodon saevus* and possesses a broad flattened heel. P_4 is much smaller than in *Aelurodon saevus*, the metaconid is more conical and has a less backward slant; the heel is low, broad and flat, and more molariform than in *Aelurodon*.

M_1 is slightly smaller antero-posteriorly, but much more reduced laterally, and has a sharper shear than the corresponding tooth in *Aelurodon*. The talonid has a well developed crushing heel, with its antero-internal surface deeply basined, but retaining on its external ridge a low-crowned hypoconid. A strong external cingulum is present. M_2 has an alveolus of medium size, oval in outline, and indicates a single-rooted tooth.

The fourth upper premolar is a strong, deep-rooted tooth, with a well developed deuterocone, connected to the inner base of the protocone by a narrow neck. The shear of the tooth is relatively short. M^1 has a well developed paracone and metacone. The inner lobe or heel is extremely wide antero-posteriorly on its inner side, and has a large protocone cusp. The large crushing heel is nearly twice as large as that of the wolverine.

Measurements of Brachypsalis marshalli

Diameter P_3: Antero-posterior—11 mm.; transverse—7.
Height P_3 above alveolar border—9.
Diameter P_4: Antero-posterior—14 mm.; transverse—9.
Height P_4 above alveolar border—11.
Diameter of the alveolus M_2: Antero-posterior—7, transverse—5.
Diameter P^4: Antero-posterior—30 mm., transverse—13.
Height of protocone of P^4—12.
Height of deuterocone of P^4 above inner alveolar border—6.
Diameter M_1: Antero-posterior—24 mm.; transverse—9.
Diameter of heel of M_1: Antero-posterior—7; transverse—6.
Length of lower jaw from front border of incisor alveoli to angle of the ramus—135.
Length from front border of incisor alveoli, to posterior border of M_2—86.
Depth of jaw below M_1—29.
Diameter of alveolus I_1: Antero-posterior—6 mm.; transverse—3.
Diameter of alveolus I_2: Antero-posterior—6 mm.; transverse—4.
Diameter of alveolus I_3: Antero-posterior—7 mm.; transverse—5.
Diameter of alveolus of lower canine: Antero-posterior—16 mm.; transverse—11 mm. (estimated).

Diameter M^1: Antero-posterior on outer face—10 mm.
Width M^1: Antero-posterior of the heel—14.
Diameter M^1: Outer to inner border of tooth—19.

Hyaenognathus cyonoides new species

Type.—No. 3468, Univ. Kansas Mus. Vert. Paleon.; right mandibular ramus with teeth, complete except for P_2, M_2, angular process, and tip of coronoid process.

Description.—In general outline the mandible resembles that of *Hyaenognathus direptor* Matthew from the Pliocene of Nebraska. The premolar region, however, is distinctly different, and P_3 and P_3 are more reduced than the alveoli of *H. direptor* Matthew would suggest, judging from Matthew's plate.

The Kansas specimen is about five-sixths of the size of *H. direptor*. The coronoid process is narrower antero-posteriorly and not so strongly built; there is less depth below P_4 and M_1; and viewed from the inner side it appears narrow and weak from the fourth premolar backwards. There is a relative as well as an actual shortening of the jaw back of the molars, and the lower border of the jaw is decidely more sharply convex.

Viewed from the inner side, the front part of the jaw, from the incisors back to the anterior base of the fourth premolar, rises to a line 5 mm. higher along the alveolar border, than it does at P_4, and M_1 and M_2, so that from the anterior base of the fourth premolar backwards, and along the base of the molar, the inner wall of the jaw does not slope gently up to the base of the teeth as it does in the wolf, but rises to within 5 mm. of the level of the base of the teeth, where it forms a shallow groove 5 mm. wide between the highest point of the sloping inner wall of the jaw and the teeth, unlike anything in either *Aelurodon* or any modern canid the writer has examined. This feature is shown in plate 21, figure 3. In *Aelurodon* exactly the opposite obtains and the incisors, canine, and back to the third premolar, the alveolar border is on a lower level than along the fourth premolar and the molar series. Unlike the type specimen of *Hyaenognathus pachydon* Merriam, the incisors are rather large, and not crowded, and the well developed canine is proportionally large.

The elevation of the forward part of the jaw, raising the premolar series to a higher level than they appear either in *Aelurodon*, or any of the canids, naturally suggests an upper premolar series much reduced. Although P_2 and P_3 are rather small, their crowns are on a higher level comparatively and actually than those teeth are in *Aelurodon*.

Although primitive characters are apparent in several instances, these are more than offset by the strong development of the fourth premolar, the presence of a prominent mataconid, and bicuspid heel on M_1, and the well developed M_2.

Anterior to the base of the broad, flat, ascending ramus of the coronoid process, below the border of the alveolus of M_2, and extending forward even with the protocone of M_1, there is a wide, rather deep groove, which coincides in depth with the deep fossa for the masseter muscle. The condyle is long and slender, and sets at a more oblique angle than in *Aelurodon*, in which respect it resembles closely that of *Brachypsalis*. The symphysis is long and narrow.

Specific characters.—Size about five-sixths smaller than *Hyaenognathus di-*

reptor Matthew; incisors strong, wide and not crowded; canine stout, conical; premolars reduced to three; the anterior two much smaller proportionally than in *Aelurodon*, double rooted; P_4 has a stronger backward pitch than in *Aelurodon;* inferior border of jaw more strongly convex, and narrower below P_4 and anterior portion of M_1.

The heel of M_1 laterally compressed on its outer face; M_2 as big as in *H. direptor* Matthew; alveolus for M_3 single rooted with wide flaring walls, indicating a wide-faced tooth.

Measurements

Length of jaw, condyle to front of symphysis,—132 mm.
Depth of jaw beneath M_1—22.
Front of canine to back of M_2—80.
Distance from front of P_3 to posterior border of M_2—59.
Diameter of canine: Antero-posterior—11; transverse—9.
Height of canine—20.
Diameter of alveolus P_3: Antero-posterior 6; transverse—5.
Diameter of P_3: Antero-posterior—8; transverse—5.
Diameter of P_4: Antero-posterior—15; transverse—10.
Height of P_4—15.
Diameter of M_1: Antero-posterior—26; transverse—11.
Height of M_1—17.
Diameter of M_2: Antero-posterior—12; transverse—18.
Height of M_2—12.
Diameter of alveolus of M_3: Antero-posterior—8; transverse—6.

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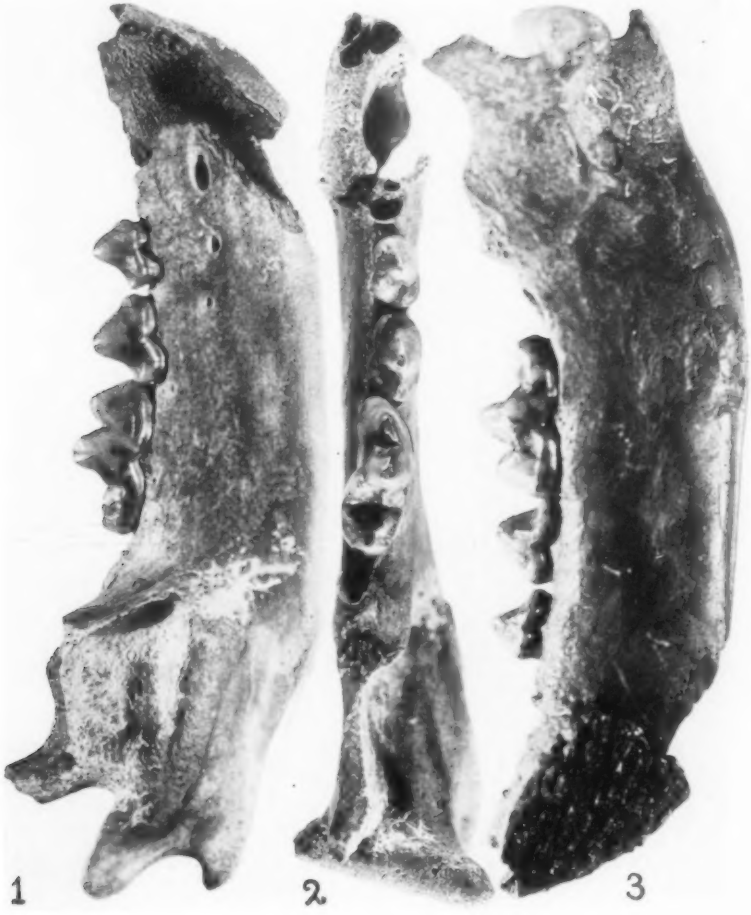
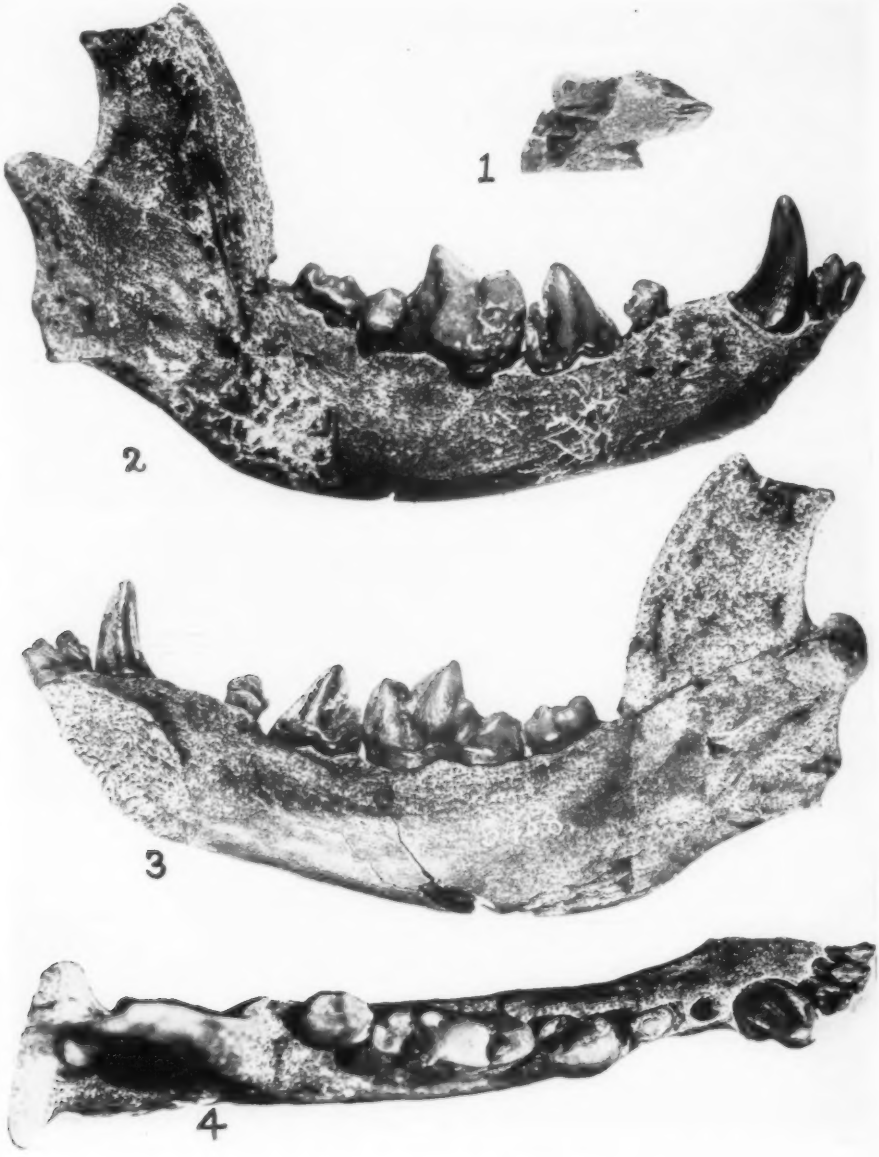


BRACHYPSALIS MARSHALLI

FIG. 1. Outer view of lower jaw. FIG. 2. Occlusal view of lower jaw. FIG. 3. Inner view of lower jaw. All figures natural size.



HYAENOGNATHUS CYONOIDES

FIG. 1. Part of left premaxillary, with incisors one to three. FIG. 2. Outer view of lower jaw. FIG. 3. Inner view of lower jaw. FIG. 4. Occlusal view of lower jaw. All figures natural size.

THE JAW OF THE FOSSIL RABBIT ARCHAEOLAGUS

By Lee R. Dice

Through the courtesy of Dr. Earl L. Packard I have been allowed to study several specimens of the fossil rabbit *Archaeolagus ennisianus* (Cope) preserved in the collections of the University of Oregon. One of these specimens consists of a skull in fairly good condition with both jaws present. This skull, No. 177, was collected many years ago on the John Day River, Oregon, but the exact locality is not recorded. Another specimen coming from Turtle Cove, John Day Valley, consists of a portion of a maxilla, containing the full set of upper molars, and a portion of a lower jaw, with an incomplete set of lower molars. There seems no reason to doubt that these specimens are typical of the species mentioned, as the enamel patterns of the teeth agree fully in character with those previously figured.[1]

One of the characters used to define the genus *Archaeolagus* was the shape of the posterior portion of the lower jaw. In all the specimens previously described or figured this portion of the jaw had been indicated as very different in shape from that of any living or fossil, rabbit or hare. I have myself examined the type and one other previously figured skull in the collection of the American Museum of Natural History, and although both of these have the lower edge of the jaw slightly fractured there was no indication that much material was absent. However, the present specimen clearly shows that the jaw is of the same general shape as in all other known leporids, and it is evident that the previously examined specimens are defective in the jaw region. In the previously examined specimens, also, the vertical rami had not been completely worked out of the matrix, and an erroneous conclusion was drawn as to the shape of this part of the jaw.

The jaw of specimen No. 177 is very similar in shape to that of *Sylvilagus bachmani* from Morro, California, though the vertical ramus is less in height. The anterior portion of the jaw is not present in the fossil specimen on either right or left side, neither is the posterior angle; but by combining the parts represented on the two sides, most of the remainder of the jaw can be reconstructed. The vertical ramus is fairly slender and short, as compared with modern *Sylvilagus* and *Lepus*. For a rabbit it has a well developed coronoid process, produced from the exterior anterior edge of the ramus. This process is a little stronger,

[1] L. R. Dice, Univ. California Publ. Geol., vol. 10, p. 180, 1917.

but not so extended as in *Sylvilagus bachmani*. At the anterior corner of the condyloid process is a conspicuous facet for articulation with the cranium. The depression on the exterior surface of the angle of the jaw for the attachment of the masseter muscle is somewhat more shallow than in *Sylvilagus bachmani* and other recent rabbits. This probably indicates weak jaw muscles. Just under the anterior molariform teeth there is a small cribiform area, similar to that found in recent leporids.

The position of the masseteric fossa (reëntrant angle between the body of the jaw and the anterior part of the mandibular angle) of the fossil in relation to the tooth row is very similar to that of *Sylvilagus bachmani* and some other rabbits. Although it can be said to be posterior to the tooth row as stated by Cope[2] this interior angle is not so sharply marked

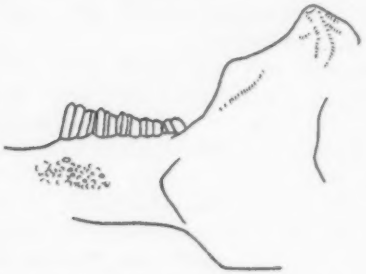


FIG. 1. MANDIBLE OF ARCHAEOLAGUS ENNISIANUS, EXTERNAL VIEW

Composite of the right and left halves of specimen No. 177, University of Oregon; from the John Day River, Oregon. ×1½.

in the fossil as in most recent lagomorphs, and the position of the fossa can not be used as a diagnostic character for the genus *Archaeolagus*.

An important feature in this specimen is the absence of the mandibular foramen, which in all modern rabbits and hares is found on the lower jaw just back of the last lower molar. By removing the matrix both lower jaws have been carefully exposed from the last molar to a point about half-way to the upper end of the vertical ramus, and no trace of the foramen can be found. If the foramen proves to be absent from other specimens of the species, this absence would presumably constitute one of the generic characters of *Archaeolagus*.

In size the fossil skull agrees closely with that of the modern brush

[2] E. D. Cope, Tertiary Vertebrates of the West, p. 886, 1885.

rabbit, *Sylvilagus bachmani*. It is too broken, however, to afford many points of measurement. The maxillary breadth is 28.6 mm.

The upper molariform teeth in the specimen from Turtle Cove agree with those previously figured in the presence of enamel crescents on the faces of the teeth, and in M^1 and M^2 these enamel crescents are connected to the exterior border of the teeth.

The characters of *Archaeolagus* may be restated to be: The simplicity of the folding of the enamel on the upper and lower molariform teeth, the main reëntrant angle of the third lower premolar not extending more than about half across the tooth; the presence of enamel crescents on the faces of the upper molariform teeth, at least in the earlier stages of wear; and, probably, the absence of the mandibular foramen.

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A NEW GAZELLE FROM NORTH AFRICA

By Angel Cabrera

The gazelle found in the high plateaus of North Africa, a region extending along the northern side of the Atlas from eastern Rif, in Morocco, to northwestern Tunisia, appears to be recognized by some modern French naturalists as a peculiar form of *Gazella dorcas*, which they mention as "variété *kevella*," but without any accompanying description, nor even a short diagnosis to justify such distinction.[1] Only Joleaud tells us that specimens ascribed to this form are "de grande taille." At all events, I consider that application of the name *kevella* to be untenable, as *Antilope kevella* Pallas, based on Buffon and Daubenton's "Kevel,"[2] is almost certainly unidentifiable. The only locality given by Buffon in connection with this antelope was Senegal, and accordingly, F. Cuvier, Desmarest, Hamilton-Smith and Owen identified it with the Senegalese gazelle now called *G. rufifrons;* but Daubenton's description and figures were made from a faded skin,

[1] See Trouessart, Catalogus Mammalium, vol. 2, 1899, p. 943; Menegaux, La Vie des Animaux Illustrée, vol. 2, 1903, p. 405; Joleaud, Bull. de la Soc. Géologique de France, ser. 4, vol. 17, 1917, p. 209.

[2] Histoire Naturelle, vol. 12, 1764, p. 204, pls. 25 and 31, fig. 2, with description by Daubenton on p. 205.

"bourrée depuis longtemps," and an incomplete skull, both without locality, and they can be referred to several different species. In fact, Gervais regarded the "Kevel" of Buffon as a young specimen of *G. dorcas*,[3] whereas Lataste identified it with the edmi or mountain gazelle (*G. cuvieri*).[4] It was, in any case, a smaller animal than the typical *dorcas*, with hind feet only 260 mm. in length.

In the introduction of a recent paper by Paul Bédé on the birds of Morocco,[5] containing very interesting information about some mammals of the same country, it is said that gazelles are still common in the high plateaus of southern Rif, although becoming rare on the chain of hills south of Ujda. As it seems, Mr. Bédé has not seen the gazelles himself, but speaks only from information received from a French "inspecteur des forêts," named Mouilleron. His informant told him that all the gazelles obtained in that region had the nose black, from which Mr. Bédé thinks it justifiable to say that "il s'agit donc bien là de la gazelle de montagne (*Gazelle cuvieri*)," asserting immediately, however, that *G. dorcas* is found in the plains of the Ouled el Hadj, about thirty miles south of Debdu and, therefore, practically within the same biotic zone.[6]

Now, in 1919 during my second expedition in Morocco, the natives of eastern Rif told me that gazelles were frequently obtained in the interior of the country, on the high plains of Guerruas, Djel and Tafrafa (approximately between lat. 34° and 34° 50′ and long. 0° and 1°), living specimens being sometimes brought both to Melilla and Ujda. I saw, indeed, a living female and two flat skins in the hands of Spanish officers in Melilla, and they were, without any possible doubt, of the *dorcas*, not of the *cuvieri*, type. Nevertheless, one of the skins, that of a semi-adult male, had the horns adhering to it, and they were more like those of *cuvieri*, without any tendency to become lyrate as in *dorcas*. I dared not, therefore, arrive at any definitive conclusion on the basis of that material only, the skins being in rather poor condition and without skulls.

Fortunately, four years afterwards, Doctor Lozano of the Madrid

[3] Histoire Naturelle des Mammifères, vol. 2, 1855, p. 203.

[4] Actes de la Soc. Linn. de Bordeaux, vol. 39, 1885, p. 294.

[5] Mémoires de la Soc. des Sc. Nat. du Maroc, No. 16, 1926, p. 25.

[6] American readers little familiar with North African geography can get an idea of the position of these localities by using the excellent map of Africa issued in 1922 by the National Geographic Society, Washington, D. C.

Museum of Natural Sciences was sent by the Real Sociedad Española de Historia Natural to study the fishes and fisheries of the Rif coast, and he happened to obtain in Melilla a living male gazelle which he brought back with him to Madrid and deposited in the zoological park. The animal lived there about two years, kept in an extensive and well sunned corral, and at its death, which followed a night of intense cold, it was presented, like all the material collected by the Real Sociedad's expeditions, to the National Museum at Madrid.

Doctor Lozano did not know the exact spot from which this specimen came, having bought it from a Spanish soldier who, in turn, had acquired it from the natives. I wrote to my friends among the native police at Melilla, asking for further information, and they told me only that the gazelles sold at that time in the native markets came always from French territory, being chiefly obtained on the plains between Taza and Gaurirt, immediately south of the Spanish-French border. These plains may be accepted, therefore, as the locality of our specimen. They are really a western extension of the Algerian "hauts plateaux," and consist of stony, sun-baked steppes about 1,700 feet above sea level, with very scanty vegetation of semi-desert type, several Saharian plants being actually found there. The prevailing vegetal species is *Stipa tenaeissima;* trees are practically absent, and the shrubs are reduced to some scattered thickets of *Zizyphus*.

My idea that the gazelle inhabiting that country belongs to the *dorcas* group has been fully confirmed by the specimen obtained by Doctor Lozano. When it reached Madrid, it was somewhat young, with a rough coat and rather short horns, and it presented on the nose a small dusky patch, like a promise of the dark spot characteristic of *cuvieri* and also of some subspecies of *dorcas* (*isabella*, *littoralis*); but by the time of its death it had become a splendid animal with perfectly developed horns and short, compact, glossy hair, and every sign of a nasal spot was lost. Its general appearance was, in life, entirely like that of an Egyptian *Gazella dorcas*, only being slightly higher on the legs, but its color is a little warmer, and the horns, instead of forming a perfect lyre as in typical *dorcas*, diverge evenly almost to the end, the tips curving forwards and a little inwards, as in the Nubian *littoralis*. Of course, it can not be confounded with this form, as, aside from the great difference of localities, *littoralis* is a little smaller than true *dorcas* and of a paler color, whereas the Rif gazelle is as large as the biggest

specimen of typical *dorcas* and has a more intensely colored coat.[7] Two other races of the same species with horns not lyrate are *isabella* of Abyssinia, and the central Sahara gazelle recently named by Levauden *G. dorcas neglecta*.[8] The last, and the only form of the group that I have never seen, is described also as a small and pale animal, and *isabella* is a very large subspecies with the horn tips abruptly curved inwards. I think all of these differences warrant the recognition of the Rif gazelle as a new form, description of which follows.

Gazella dorcas massaesyla subsp. nov.[9]

Type.—Adult, but not old, male, skin and skull with horns, from the high plateaus of the Rif, Morocco, south of the Spanish-French frontier. National Museum of Natural Sciences, Madrid (history as above; not yet registered by number when I left Spain, September, 1925).

Diagnosis.—A warm-colored race of *G. dorcas*, with horns very similar to those of *G. d. littoralis* and not distinctly lyrate as in the typical subspecies.

Color.—Upperparts soft brown, somewhat between cinnamon and pale burnt umber, distinctly paler along the flanks and paler still on the sides of the head, on the underside of the neck and on the legs. Dark flank-band broad, well defined, of a brown hue very near bister; pygal band short and narrow, but neatly marked, mummy brown. Middle of the face brownish burnt sienna, a little brighter and tending to russet about the forehead, and paler and buffy over the nose. Dark preorbital mark mummy brown, bordering posteriorly a narrow whitish space which goes up from each side of the muzzle to surround the eye. Back of ears buffy drab; carpal tufts small, fuscous; tail black; underparts and hind aspect of thighs, white.

Skull and horns.—The skull does not differ in size and structure from that of typical *dorcas*. The horns are long, robust, evenly divergent almost to the very tips, and in general rather similar to those of the specimen of *littoralis*, No. 173323 in the United States National Museum, figured by Miller[10] under the name *isabella*, the tips, however, being not bent so much inwards. The type has twenty-one ridges on each horn.

Measurements.—Type (the external measurements taken in flesh; the height

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[7] *Littoralis* was, by the way, originally described as a true species different from *dorcas* (Blaine, Ann. and Mag. Nat. Hist., ser. 8, vol. 9, 1913, p. 295), but there is no reason to consider it so if *isabella* is given only subspecific rank. The differences in the skull, pointed out by Blaine, are without value, the skull details being in these ruminants very variable, as shown by Miller for *littoralis* (Proc. U. S. Nat. Mus., vol. 42, 1912, p. 171; material at that time identified with *G. isabella*).

[8] Bull. de la Soc. d'Hist. Nat. de l'Afrique du Nord, vol. 17, 1926, p. 12.

[9] Named from the Massaesyli, a people inhabiting the high plateaus of Mauritania in antiquity.

[10] Loc. cit., pl. 15, fig. 3.

on the living animal about two months before death): Head and body, 900 mm.; tail vertebrae, 150; ear from notch, 140; hind foot, 290; height at shoulder, 550. Skull: Condylobasal length, 165; tip of premaxillae to orbit, 82; greatest width, 77.5; palatal length, 86; greatest length of nasals, 43; combined width of nasals, 21; upper molar series, 55.5. Horns: Length on front curve, 260; circumference, 100; tip to tip, 160.

In my opinion, this gazelle is the same as the undescribed *kevella* of Trouessart and other French authors (not of Pallas), its range extending very probably eastward along all the Algerian "hauts plateaux" between the mountains of the Tell and the Atlas. At least, I have seen in the British Museum of Natural History a specimen from the Constantine department, midway between Constantine and Biskra, very like the one described above. It is the specimen recorded by Lydekker in his "Catalogue of the Ungulate Mammals"[11] as representing "a gazelle with longer limbs and less curved horns than the typical *dorcas*." There are in the same collection some gazelles from Biskra representing evidently the typical subspecies, with lyrate horns, and one of these has been also figured by Lydekker. It seems, therefore, that we have in Africa Minor two different races of this species: *G. dorcas dorcas* in the northern rim of the Sahara, and *G. dorcas massaesyla* in the zone of the high plateaus, separated by so important a barrier as the Atlas chain, where the genus is represented by *G. cuvieri*, a species belonging to a very different group.

La Plata, Argentina.

[11] Vol. 3, 1914, p. 75.

A NEW CRICETINE GENUS FROM CHINA

By Glover M. Allen

Through the kind offices of F. R. Wulsin the Museum of Comparative Zoölogy has lately received an interesting collection of small mammals made by the missionary, Robt. B. Ekvall, in the vicinity of Choni, southern Kansu, China. While no notes as to the local conditions there are available, it is known that this is mountainous country and the character of its mammalian fauna indicates that it is at least in part forested. Among the forest-living species represented in the collection are several of the large flying squirrel, *Petaurista xanthotis*, a large series of field mice, *Apodemus*, and the long-tailed shrew, *Soriculus;* other genera, as *Eutamias*, the chipmunk, *Allactaga*, the five-toed jerboa, and *Ochotona* represent types of the more open country. Among the specimens are two skins with skulls of a cricetine species which appear to represent an undescribed genus. It may be named

Cansumys, gen. nov.

Externally recalling the larger species of *Cricetulus* (subgenus *Urocricetus*) in the relatively long tail, which is about half the length of head and body, but differing in having this member thickly haired; color pattern differs in the presence of a prominent white mark at the lower border of the ear opening. The feet are remarkably small and slender, with longer fore toes proportionally. Hind foot with proximal third of sole hairy.

The skull has its dorsal profile evenly convex; the audital bullae are large, rounded, and project well below the level of the palate; they are remarkable for being closely approximated anteriorly so that the least distance between them is less than the width of the interpterygoid fossa instead of being much wider as is the usual condition in the related genera, *Cricetus*, *Cricetulus*, *Cricetiscus*, *Phodopus*. Other peculiar features of the skull are: the weakly developed antorbital plate which resembles that of *Cricetulus* in being slightly emarginate rather than projecting as in *Cricetus;* the broad strap-shaped interparietal, a bone that is small and triangular in the other genera mentioned; and especially the presence of raised supraorbital ridges which, commencing at the proximal ends of the nasals, are most prominent over the orbit and diverge evenly backward following the general boundaries of the lateral edge of the parietals, and include a deep gutter between them anteriorly.

The analogous ridges in the skull of *Cricetus* meet in adults at the anterior edge of the parietal and then diverge slightly along the summit of the skull. In *Cricetulus* no ridges are present. The rostrum is rather longer in proportion than in *Cricetulus* with the long narrow incisive foramina from which well-marked grooves are continued to the posterior arched border of the palate. On the sides of the rostrum the course of the incisor root is indicated by an obvious raised ridge, a trait that is but slightly marked in the other genera examined.

The incisor teeth are relatively strong, the upper ones broad, with flattened anterior face and wide cutting edge. The maxillary tooth rows diverge slightly in front, so that the axis of the foremost tooth is slightly but distinctly turned outward. This tooth consists of the usual three pairs of cusps in transverse series with a notch in the median line in front; with wear the central depressions between the two rows of lateral cusps become cut off as three elliptical islands of enamel with their long axes turned outward at an angle to the tooth row; the second and third molars are subequal in size (the third is shorter than the second in *Cricetulus*) and consist of two pairs of cusps of which the inner are more or less crescentic in crown view with the anterior horn of each crescent projecting outward in front of the corresponding outer cusp. This horn is better developed in the anterior cusp so that with moderate wear, this horn and the outer cusp of the front half of the tooth make two short external projections, while in the back half of the tooth the two projections are much less obvious. The valley between the pairs of cusps in the anterior half of the last two molars becomes worn away until it is represented by an elliptical or sausage-shaped enamel lake the long axis of which is distinctly turned outward in front, that of the corresponding posterior lake less so; or in the last molar it may appear as two small roundish enamel circles.

The type and only known species of this genus is the following:

Cansumys canus, sp. nov.

Type.—Adult female, skin and skull, No. 23779, Museum of Comparative Zoölogy, from Choni, southern Kansu, China. December 9, 1925. Robert B. Ekvall, collector.

Color.—Dorsal surface of the body and tail all around of a general hoary gray. The hair of the middle of the back is about 15 mm. long, of which the basal 12 mm. are slaty gray with a short whitish tip; interspersed are numerous all-black hairs, and on the sides of the body a faint wash of buffy is apparent. The backs of the feet, a narrow median area from the chin to chest, a conspicuous spot on each side of the muzzle at the base of the vibrissae, and another at the outer base of each

ear are pure white to the roots of the hairs; elsewhere on the ventral surface of the body the fur is slaty gray at base broadly tipped by whitish. The outer surface of the low, rounded ears is covered with short dark-brown hairs, the inner surface (metectote) with blackish hairs. The tail in the adult is thickly covered with fine hairs, about 10 mm. long at the base of the tail and about 7 mm. near the tip.

Skull.—The chief peculiarities of the skull and teeth have been already described in the account of the generic characters.

Measurements.—The collector's measurements of the type are: total length, 9.75 inches (248 mm.); tail, 4.25 inches (108 mm.). The hind foot, measured from the dried skin, is about 20.4 mm.

The skull measures: basal length, 31.7 mm.; palatal length, 18.8; zygomatic width, 18.0; width of braincase, 13.8; length of bulla, 8.0; distance between bullae, 1.0; width across outer edges of anterior molars, 7.1; diastema, 9.2; length of incisive foramina, 7.0; width of interparietal, 10.7; length of upper molar row (alveoli) 6.6; lower molar row, 6.6; jaw, condyle to base of incisor, 21.6.

The discovery of this peculiar cricetine adds another to the many interesting mammals of Kansu. Of the two specimens secured, one is immature with the tail shorter-haired than in the adult. The latter, however, has a shaggy tail, which with the slender delicate feet gives it the appearance of a tree-living mammal, in strong contrast to the close-haired tail and relatively heavy foot of burrowing members of the subgenus *Urocricetus*. The conspicuous white tuft at the base of the ear recalls similar ornamentation in some tree squirrels. In cranial characters it is widely different from other eastern cricetines, combining some of the features of *Cricetus* with other peculiar characteristics of its own. The relationship to *Cricetulus* is apparently not very close. Should it eventually prove to be in part at least a tree-living species, it would stand in further contrast to the Asiatic cricetines all of which are burrowers, mostly with short tails, except *Calomyscus* with a long tufted tail of whose habits very little is known. I am indebted to Dr. B. Vinogradov of the Zoölogical Museum of the Russian Academy of Sciences for notes upon the type of *Cricetulus kamensis* from eastern Tibet, which is apparently allied to *C. triton* of China.

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GENERAL NOTES

THE FLORIDA OPOSSUM ON THE COAST OF SOUTH CAROLINA

Inasmuch as the northern limit of *Didelphis virginiana pigra* Bangs is usually given as the lower coast region of Georgia, I was much interested in certain references to this form in Allen's "Preliminary Study of the North American Opossums of the Genus Didelphis" (Bull. Amer. Mus. Nat. Hist., vol. 14, p. 166, 1901). Under "Specimens examined" is the following: "Georgia, Riceboro 1, Beaufort Co. 5." No reference is made to South Carolina, but in view of the fact that there is no county of this name in the state of Georgia it seemed probable that the animals had come from Beaufort County, South Carolina. After learning from H. E. Anthony that the specimens in question were not in the American Museum of Natural History, I wrote Gerrit S. Miller, Jr., who very kindly looked into the matter, located the specimens in the U. S. National Museum, and advised me that the five Beaufort County specimens examined by Allen were all from St. Helena's Island, Beaufort County, South Carolina.

In September, 1926, the Charleston Museum received a live opossum from one of the nearby coastal islands. This individual lacks the flesh-colored tips to the ears, these members being wholly black, and in addition it appears somewhat darker than other specimens that we have. The animal is being kept alive and has not been critically examined, but it will probably prove referable to the Florida form.

In view of the above it seems that the lower South Carolina coast should be considered the northern limit of *Didelphis virginiana pigra*.—E. B. CHAMBERLAIN, *Charleston Museum, Charleston, South Carolina.*

A RECORD FOR SOREX FONTINALIS

On August 28, 1927, Margaret Wetmore found a dead shrew near Lock 11 on the Chesapeake and Ohio Canal near Cabin John, Maryland, that proves to be *Sorex fontinalis* Hollister, one of the rarer mammals of the vicinity of Washington. The animal was lying in a path on the north bank of the canal at the point where the small stream known as Rock Run enters a culvert to pass beneath the canal, directly opposite the property of the Washington Biologists Field Club. On skinning this shrew I found small punctures in the back of the head and shoulder region which may indicate that it had been killed by an owl. The specimen is in the collection of the National Museum (No. 252545) where the identification has been verified by Dr. H. H. T. Jackson. This species, described by Hollister in 1911 from a specimen taken in a sphagnum bog near Beltsville, Prince Georges County, Maryland, has been found on few occasions. The present record marks its first known occurrence west of the District of Columbia, other reports having come from the western edge of the coastal plain east of Washington, with the exception of one taken to the north at Sandy Spring, Maryland.—ALEXANDER WETMORE, *U. S. National Museum, Washington, D. C.*

A GRAY SHREW IN A WOOD RAT'S NEST

While catching wood rats (*Neotoma fuscipes macrotus*) in a dry canyon in East San Diego, California, on May 7, 1927, I discovered a gray shrew (*Notiosorex*

crawfordi) in a wood rat's nest and captured it. The wood rats were taken with the assistance of a number of boys who surrounded the nest and tore it down, catching the animals as they ran out. An adult female and two immatures had been captured at this nest and the pile of sticks and other debris had almost been leveled with the ground when the shrew made its appearance. It seemed bewildered by the tearing down of its sanctuary and was easily taken by hand. It squealed shrilly but made no attempt to bite.

The shrew was placed in a small cage and it eagerly devoured some cutworms and isopods that were offered it. It seemed unable to crush the hard shells of the little crustaceans and after swallowing them would go into convulsions and eject them. This was repeated several times. It fled precipitately from a Gambel white-footed mouse (*Peromyscus maniculatus gambelii*) that was placed in the cage with it, moving then with such rapidity that the eye could scarcely follow it. It appeared healthy when last seen on the evening of the day it was captured, but was dead on the following morning.

It proved to be a female with three pairs of mammae, all placed near the vent and between the hind legs. The teats were large and seemed to suggest that it had recently suckled young but no nest had been found in the wood rat's home that could have belonged to the shrew. The measurements of the specimen were: Total length, 90 mm.; tail, 29 mm.; hind foot, 10.5 mm.; ear from crown, 5 mm. Trapping in the neighborhood failed to procure any additional specimens.—FRANK F. GANDER, *East San Diego, California.*

RED BAT AS A MOTHER

Godman's Natural History gives an instance of maternal devotion on the part of a red bat observed more than a century ago. "In June 1823, the son of Mr. Gillespie, keeper of the city square, Philadelphia, caught a young red bat, which he took home with him. Three hours afterward, in the evening as he was conveying it to the Museum in his hand, while passing near the place where it was caught, the mother made her appearance, followed the boy for two squares flying around him and finally alighted on his breast, such was her anxiety to save her offspring. Both were brought to the museum, the young one firmly adhering to its mother's teat."

Two instances like the foregoing have come under my observation at Bowling Green, Ohio. One of these occurred on June 22, 1915, and has already been recorded by the author (Our wild animals, pp. 164–165, 1927). The other happened on July 6, 1916, when a red bat ((*Nycteris borealis*) and three young were found on the ground near a lilac bush in a yard in Bowling Green, Ohio, and were taken to the Normal College, nearly half a mile away. At dusk the mother, being released, could be seen for a short time flying back and forth in the pursuit of insects, but was soon lost to view. The young bats were not yet able to fly. At nine o'clock they were still clinging to the branch under which I had placed them after pulling them lose from their mother. At ten o'clock they had gone; there can be little doubt that the mother had returned and taken them away.

The release of the bat last mentioned was in the presence of several hundred persons assembled on a pleasant summer evening for a community song-fest at the administration building. Until ten years later I was not aware that anyone

tarried, after the dispersal of the crowd, to see if the mother would return to her young. Before leaving the building I had instructed the night watchman, when he made his rounds, to look into the box, and see if the little bats were still there. In the fall of 1926, after I had read the preceding paragraph to my zoology class, one of the older students told me that he and another lad who were present at that song-fest had enough curiosity to remain and watch for the bat's return. Before 9:30 they saw her make three or four circles above the college steps while emitting a squeaking sound. Presently she came to rest on the box that contained her little ones. When she had flown, the boys looked into the box, but no bats were there.—E. L. MOSELEY, *Normal College, Bowling Green, Ohio.*

THE NUMBER OF YOUNG RED BATS IN ONE LITTER

In July, 1918, a red bat (*Nycteris borealis*) with four young was brought to the Normal College at Bowling Green, Ohio. Another with four young was found here in July, 1926. In the two instances in which red bats had been released, and returned after a while for their young, there were three of the latter. Another red bat with three young was found at Bowling Green, June 7, 1921. Judging from their size they were born before the first of June. Three red bats found with their mother at Sandusky on June 15 were hairless and appeared not to have had their eyes open, but were not very small, so that they may have been more than a week old.

The red bat has four teats instead of two, the usual number in bats. The hoary bat (*Nycteris cinerea*) is said often to produce more than two young at a time. A Georgian bat (*Pipistrellus subflavus*) examined by Walter L. Hahn in Indiana on the sixth of June contained three very small embryos.—E. L. MOSELEY, *Normal College, Bowling Green, Ohio.*

WEASELS EAT SHREWS

In the May, 1921, issue of the JOURNAL OF MAMMALOGY, George L. Kirk published a note on shrews and weasels. Mr. Kirk, while trapping for weasels, caught shrews. Although weasels were numerous, they did not feed on the trapped shrews. To quote Kirk: "A weasel will take almost any kind of bait in the form of meat, but tracks in the snow showed that if a Bonaparte weasel approached the trap when it held a shrew, it kept at a distance of four inches and refused to touch the bait." Mr. Kirk further adds that a trapped weasel was untouched by the shrews.

While the latter statement may be correct, the first should be qualified. L. E. Adams (Mem. and Proc. Manchester Lit. and Phil. Soc., vol. 54, no. 10, p. 2, 1910) says: "I have often seen weasels carrying off dead shrews across the country roads, and Mr. C. Oldham informs me that he has found a dead Lesser Shrew [*Sorex minutus*] in a weasel's nest."

A small female *Mustela cicognanii* from Malone, New York, taken November 26, 1924, contained the unmistakable remains of a short-tailed shrew. A specimen of *Mustela noveboracensis* taken December 4, 1927, likewise contained the tail, fore foot, and fur of *Blarina brevicauda*. Perhaps these insectivores are eaten only as a last resort, but the region in which the latter specimen was taken always

supports an abundance of cottontails and wood mice.--W. J. HAMILTON, JR., *Dept. of Biology, Cornell University, Ithaca, New York.*

DOGS DISLIKE FOX FLESH BUT RELISH THAT OF WILD-CATS

A friend of mine, who is given to much trapping, has tried feeding experiments on his large kennel of dogs with the flesh of his trapped mammals. He finds that all of his dogs take with relish wild-cat flesh that has been cooked, but fox flesh is distasteful to his terriers and police dogs, neither of which will eat it, even when they are starved moderately. A small portion of fox meat mixed with their grain ration will spoil the meal. On the other hand wild-cat meat, which cooks to tenderness in twenty to thirty minutes and quickly falls to pieces in cooking, is a most welcome portion of their diet.

Another trapper nearby regularly cooks wild-cat flesh for the family table and claims it is most tender and agreeable.—ROLAND CASE ROSS, *Nature Department, Los Angeles City Schools, Los Angeles, California.*

AN UNUSUAL MIGRATION OF THE SPOTTED AND RIBBON SEALS

When in northwestern Alaska in 1921–1922, collecting habitat groups of the birds and mammals for the Colorado Museum of Natural History, I trained several of the native boys to collect specimens. One of them, an especially bright man, speaks and writes English, and we have carried on a correspondence during the last five years, in which time he has collected many valuable specimens for me. Under date of August 1, 1927, I received a letter from him at his home at Cape Prince of Wales, in which he relates a most unusual migration of seals overland after the lagoons had been frozen suddenly, so the animals had no chance to get to the open sea. The spotted seals (*Phoca richardii pribilofensis*), kasageuk of the Eskimo, are very common in the lagoons, while the ribbon seals (*Phoca fasciata*) have always been considered very rare, even by the Eskimos. So, aside from the overland journey narrated below, the occurrence of the ribbon seals in numbers is worthy of note. The letter, with personal items deleted, is as follows:

"I lost a whale in April on account of the young ice. There had been a good walrus hunting this last spring. Most of the walrus were this side of Bering Strait. None of the boats get near the Diomede this spring. I did not hunt at all in June. My boy has been ill all this spring and he is better now.

"I went to Nome with eight boys in my boat, taking teachers and their baggage. We left June 17 and arrived in Nome on 21st. The shore ice was just breaking some places so that delayed us, both going down and coming back. There has been lots of ice this spring on Alaska side. We arrived here on 4th of July and there were lot of ice by the shore all the way to Nome to here. There were lot of walrus here up to July 20th, close by, too. We always see them in large herds from the village. We killed quite a few, mostly bulls, after 4th of July; sometimes we just had to tow them to shore. Every one had lot of meat stored away for the winter and had lot of hides.

"Last fall I built a winter camp at Metlatavek, you remember that opening of the Lopp Lagoon near Mint River. I took another family with us. We hunt seal with nets and we caught ninety seals in a few days. We also caught few foxes during the winter. Had some fish from the river too all winter.

"We had sudden freeze up last fall, when the ice was formed and froze solid near the shore in the lagoons, never open up again. In about the middle of December the ribbon seals began to crawl over the ice and overland toward South. I have seen some of their tracks around the Potato Mts. Once I killed one up the Mint River about ten miles above the mouth of the river. Another time I trailed one back of the Potato Mt. They traveled always South over mountains as long as they were moving along. I can see they stopped for hours in certain places. They travel few miles a day. There were about ten were found by the boys. Some found up by the cape Mt. Most of them had their hair worn on the belly. One man killed three just came out of the water from the hole in the ice. They would be fat as could be after they crawled several days. I secured two for the Colorado Museum.

"I will tell why they were crawling overland, you may have known and heard about it before. The spotted and ribbon seals would not get froze up in the Arctic, if they are caught up they would stay in their hole in the ice as long as they can stand it or wait for breaking up of shore ice in the fall and follow the open water. If not they will crawl overland in order to get to the South. In the spring the spotted and ribbon seals follow the last bunch of ice.

"I moved my family here in middle of March in order to make preparation for the spring hunt. I am going to move up soon again to hunt seal this fall and get ready for the trapping."

Potato Mountains mentioned above is a rather high range several miles inland on the inside shore of Lopp Lagoon. Cape Mountain is the high range near Wales, as the small Eskimo village at Cape Prince of Wales on the western tip of North America is known. There is no doubt about the truth of the Eskimo's statements.—ALFRED M. BAILEY, *Chicago Academy of Sciences, Chicago, Illinois*

CAN THE FLYING SQUIRREL COUNT?

The following incident was observed on September 3, 1925, in an aspen (*Populus tremuloides*) forest about 2 miles north of Bagley, Minnesota, by Dr. Henry Schmitz, two students of the University of Minnesota Forest School, and the writer. The forest was about 50 years old, quite dense and composed almost wholly of aspens about 60 to 70 feet high and 6 to 11 inches in diameter.

As we approached a decaying stub of aspen about 15 feet high, something flashed out of an old woodpecker hole about 10 feet up and disappeared. Prompted by curiosity, we shook the stub and, in doing so, pushed it over. A few inches below the entrance hole was a soft nest of fibers and fur in which were partly buried several young, only a few days old, of what proved to be the flying squirrel, doubtless *Glaucomys sabrinus*. In the hope of saving the helpless and interesting family, we put the stub back on its stump, propped it up and left it. Our work kept us quite near it, however.

In a few minutes an adult flying squirrel was seen to enter the hole in the stub. An instant later she reappeared with a baby squirrel held in her mouth by the skin of its back. She climbed down the stub, went off along the ground about 50 feet and climbed up a living aspen to a hole in a dead fork about 50 feet above the ground and disappeared. After a minute she came out without the baby, looked around, dropped into the air and with a beautiful long curving swoop landed

at the base of a tree perhaps 10 feet from the nest stub. Again she went in and came out with a baby as before, which was also taken to the second nest high up and out of danger. Another long graceful swoop to the same spot and again she went to the stub. The third baby was rescued in exactly the same way the first two had been. The process was repeated until baby squirrels number four and five were deposited in their new home. Once again, she appeared, made the same long swoop and went into the nest hole in the old stub. She stayed perhaps a few seconds longer than the other times but this time came out without a baby, went back to the new nest, and disappeared—for good as far as we were concerned.

Flying squirrels are not commonly seen in this region even by those who spend much time in the woods. I am not sufficiently familiar with them to know their usual nesting habits, but it seems possible that the nesting record, the occurrence of two nest holes ready for use by the same family, the moving of the family from one to the other, and the evidence that the parent does not know how many young she has except by going back to make sure that one is not left behind, may be interesting to others as they were to those who saw them.—JOSEPH KITTREDGE, JR., *St. Paul, Minnesota.*

BEAVERS RESUME EARLIER WORK

While on a recent visit to Cranberry Lake, New York, I spent considerable time in observing some very interesting beaver cuttings on one of the larger islands in the lake. A colony of lake beavers had been doing fresh work upon several large aspens near the shore, but attention was immediately drawn to a particular tree. This was one of many, in the vicinity of the beaver lodge, that had been partially or wholly felled and then deserted several years ago, perhaps because of a short open season on beavers and consequent annihilation of the tribe.

This tree was not entirely girdled during the first onslaught and has managed to keep alive until now, even though only a few inches of connecting bark remain and fungi have started to attack it as indicated by several small fruiting bodies at the lower right-hand side of the scarred trunk. By far the most interesting feature, however, seems to be that a new cutting has been started upon the old, the new tooth-marks standing out in sharp contrast to those originally engraved upon this now apparently doomed tree. The final result of this renewed activity will be watched with keen interest.—WILLIAM M. HARLOW, *New York State College of Forestry, Syracuse, New York.*

BEAVER BEHAVIOR

From the window of the log cabin I saw on May 31, 1927, an old beaver leave the bank of Hellroaring Creek, four miles north of Yellowstone National Park, and in his slow, lumbering, awkward way proceed up the small spring creek to some aspen trees about two hundred yards from the larger stream. All of the aspen trees had been cut by beavers along this small tributary, except three or four trees at the upper end, and these had been partly cut into at the base. As soon as the beaver was well away from the larger stream, I walked out and seated myself on a log beside his well defined runway to await his return. It was fully five minutes before I observed him returning leisurely waddling along, clambering over logs,

wallowing through one or two muddy places, until he arrived within a few feet of where I was sitting.

He was carrying a ridiculously small chip, not more than five inches long, behind his curved teeth; and I wondered why he should make such a long trip, fully four hundred yards, for such a mere piece of aspen. He was not more than six feet away when he became aware of my presence and stopped. I could see his eyes enlarge with wonder and surprise, then change to fright as he glanced on all sides for an avenue of escape and realized that he was a long way from the large creek and safety.

Finally dropping the chip and balancing himself on his hind feet, his front hand-like paws hanging loosely, he looked for an avenue of escape. First he looked to the right, then to the left several times, regarding me intently between times, at last making a dash to the right, which was the nearer way to the stream. I easily kept pace with him and would not allow him to get into the water. After a run of not more than forty yards, he stopped and slapped the ground with his tail several times. As I approached close enough to reach down and touch him, he slapped his tail a few more times and made another unsuccessful dash for the creek. After several more trials, each a little more feeble than the preceding one, he allowed me to stroke him on the back, arching it up as if he enjoyed the sensation.

I petted him for a few minutes on the sides and back, which he evidently enjoyed greatly, as he made no further attempt to escape. When I stepped away a few feet, he proceeded on to the creek and dived into it with a great splash. Almost immediately he came to the surface, swam to a small projecting boulder, and climbed out on it. I approached to the water's edge and he regarded me now without the least show of fear, and as if to show me that he was not always the awkward, clumsy performer I had witnessed on land, he did diving and swimming stunts for me until it grew quite dark.—W. M. Rush, *U. S. Forest Service, Livingston, Montana.*

CUTTING OF OAKS BY BEAVERS

The afternoon and night of July 27, 1927, I camped by the Arkansas River, about five miles west of the little station of Texas Creek, Colorado. The camp was in an open park or flat by the river, and scattered here and there about it were clumps of scrub oaks. Beside the river was a single yellow pine, and a clump of mountain birch (*Betula fontinalis*), some of the stems of which were four or five inches through. Some of the smaller trunks had been cut off by beavers. There was a lone cedar tree (*Juniperus*) on the flat. While wandering about near camp I found a number of stumps of oaks that had been cut by beavers some time in the past. These stumps varied from an inch to five inches in diameter, and up to a foot or more in height. In one group of green trees, which would be included in a space thirty by fifty feet, I counted fifty-seven of these stumps. Another lot of ten was found, and many more were scattered about the park. That they had been cut quite a while ago was shown by the condition of the stumps, the tops being much checked and cracked, while the roots had rotted away so that the stumps were easily pushed over with the foot, as I found when I wished to take a few for specimens. I have been unable to procure any information as to when there were beavers along this part of the Arkansas. I found none

of the trunks anywhere about. In driving down beside the river afterward I noticed more of these oak stumps about a mile below our camp.

The only other place where I have found oaks cut by beavers is Beaver Creek, in northern El Paso County, Colorado. One would think oak bark would be bitter food, but it was that or nothing at this particular place by the Arkansas. Certainly the oaks were not cut for anything but food, for the river here is too wide and swift for a dam.—EDWARD R. WARREN, *1511 Wood Avenue, Colorado Springs, Colorado.*

SOME OREGON PHENACOMYS

Phenacomys silvicola

The type specimen of *Phenacomys silvicola* was taken near Tillamook, Oregon, October 25, 1916, and remained unique until 1924, when a female and four small young were taken from a nest in a tree near Corvallis, Oregon, and recorded by H. M. Wight, (Journ. Mammalogy, vol. 6, p. 282, 1925).

On February 1, 1926, my brother, Peter P. Walker, who secured the type of *Phenacomys silvicola*, presented me with another specimen in the flesh taken 6 miles south of Tillamook under the following circumstances. Employees of the Coates Driving and Boom Company in the course of their logging operations removed by blasting a hemlock snag about two feet in diameter and twenty feet high. Quite a hole was blown in the earth under the stump, and immediately after the blast workmen saw four or five mice in this excavation. My brother, who was employed by the company, captured one of the mice but the others escaped. Fragments of what was unquestionably the nest were noted at the time. On the following day I visited the place, but the shattered pieces of the snag had been removed and no trace of the nest could be seen. However, when I examined the debris in the pit, I found the somewhat mangled remains of another tree mouse, the animal undoubtedly having been killed by the blast.

On examination the hemlock snag was found to be hollow, and the cavity, though small, extended the entire length. Now from the fact that immediately after the explosion several of the mice were noted alive in the pit, it is apparent that they must have had a nest either underneath the stump or, what seems more probable, low down in the cavity, and not as in the case of the only other nest of this species that has been discovered, on, or in, the broken-off top of the snag. The snag stood on a hillside, and the surrounding country was very rugged and clothed with first growth Douglas fir and hemlock of large size. In the immediate vicinity of the place where the mice were taken the timber, which was exclusively hemlock, had recently been cut and still lay upon the ground.

The first of the two specimens here recorded was a male, and the measurements are: total length, 177 mm.; tail vertebrae, 71; hind foot, 22.5. The other, a female, measured; 174; 71; 22. This, I am informed by A. B. Howell, is the first time that a fully adult pair of either species of tree mouse has been found in one nest.

Phenacomys albipes

A *Phenacomys albipes* was taken June 3, 1927, at Gardiner, near the mouth of the Umpqua River, Oregon. This specimen was trapped on the brush covered bank of a tiny creek high up on the hillside above the river. I at once took up

some traps from another part of my line and placed them in this location but no more *Phenacomys* were obtained during the twelve days that I spent collecting at Gardiner. This species has been taken in Oregon at Vida, on the McKenzie River, and at Blaine and Netarts, Tillamook County, but has not previously been recorded from the coast region between Tillamook County, Oregon, and Humbolt County, California. Measurements of the present specimen, a male, are; total length, 168 mm.; tail vertebrae, 67; hind foot, 20.—ALEX. WALKER, *Tillamook, Oregon.*

SOME UNUSUALLY LARGE SPECIMENS OF NORTH AMERICAN VOLES

The capture of unusually large specimens of mammals gives a collector a thrill akin to that of the angler who hooks a large trout. The following specimens of North American voles, all measured in the flesh by myself, seem to be giants of their species. The measurements given are those of total length, tail vertebrae, and hind foot, in millimeters.

Microtus pennsylvanicus pennsylvanicus.—Adult ♂, Malaga, New Jersey, February 3, 1925; 197, 65, 24. This individual's tail length is 49 per cent of head and body, which, in my experience, is relatively large also. Did this vole's long tail give it mobility and dodging ability to evade enemies?

Pitymys pinetorum scalopsoides.—Adult ♂, Haverford, Pennsylvania, October 18, 1924; 133, 25, 19.

Clethrionomys gapperi gapperi.—Adult ♀, Iroquois Falls, Ontario, July 15, 1925; 158, 48, 21.—MORRIS M. GREEN, *Ardmore, Pennsylvania.*

NOTE ON THE LIFE HISTORY OF THE WOODLAND DEER MOUSE

The following account of the behavior of a female *Peromyscus leucopus noveboracensis* and her young is based on observations made at C. D. Bunker's hunting cabin seven and one-half miles southwest of Lawrence, Douglas County, Kansas, on October 7, 1927, between 2:30 and 2:35 p.m.

When Mr. Bunker and I entered the well lighted cabin we surprised a female woodland deer mouse that dashed away and scattered on the floor her four young that had been clinging to her teats. While nursing the young, the female presumably had been lying on the open cabin floor. Within thirty seconds the mother reappeared and picked up, with her teeth, one of the young. This she carried across the floor and up the canvas-covered wall and deposited on a horizontally projecting piece of canvas in an upper corner. The mother then carried the three other young, one at a time, into an adjoining room. The first and third of these she concealed beneath a cupboard and the second in a pile of stove wood. After the fourth had been carried to a place of the mother's choosing, she returned and searched about the floor as though she expected to find another young one. During this search the mother uttered several shrill squeaks that we interpreted as calls to the young. Finding no more young, the mother sat on her hind feet on the open floor and with her forepaws cleaned her lips, face, neck and chest. In combing the hair on her belly the incisor teeth, as well as the fore feet, were used. Finally, she took alarm at the movements of her observers and scampered away, although the movements were not more abrupt than ones made, and to which the mother apparently gave no attention, while she was retrieving her young.

We were surprised at the climbing ability of the female. With a young mouse, which twenty-four hours after capture weighed six grams, grasped in her teeth, she readily ascended the canvas-covered wall. In descending the same she proceeded head first, straight downward. The hind feet were held wide apart and the toes pointed backward. The whole procedure suggested a miniature *Sciurus* climbing and descending a tree.

The female carried each of the young belly up. The last one she retrieved was less than five feet from us and we made out that she manipulated it as follows: Approaching the young from the front she grasped it with her incisors by the nape of the neck and pulled it to her, balanced herself on her hind feet, and patted one paw on the young one's head and the other on its posterior end, at the same time turning the young belly up. Apparently, as a result of this treatment, the young curled its body into a semi-circle. This done, the female grasped it somewhere on the underparts with her incisors and, adjusting it slightly with her fore feet, scampered away. In crossing the door sill between the two rooms, the mother steadied the young with her fore feet and progressed for one or two jumps on her hind feet alone.

Recalling that squirrels and some other rodents are known to carry their young belly up (see Lang, Jour. Mammalogy, vol. 6, pp. 18–24, 1925) rather than by the back of the neck, as cats and dogs do theirs, one is lead to wonder if the difference is constant; that is, whether or not it is the universal, or at least general, habit of Rodentia to carry their young belly up and whether or not it is the universal, or at least general, habit of Carnivora to carry their young back up.—E. Raymond Hall, *University of California Museum of Vertebrate Zoology, Berkeley, California.*

RECENT LITERATURE

Anthony, H. E. FIELD BOOK OF NORTH AMERICAN MAMMALS. New York and London: G. P. Putnam's Sons. 12 mo, pp. xxv + 625, 150 text figs., 48 pls. (32 colored, 16 halftones), 1 col. zone map. Cloth. $3.50. June 8, 1928.

This volume is an effort to fill "a real and definite need for a work of field book size which will give some space, brief though it may be, to each and every recognized species and subspecies of North American mammal." It is intended primarily as a field book for the layman, and as such should meet a useful purpose. In it are treated 1,445 species and subspecies of North American mammals, the term North America being used to include all of the continent north of the Rio Grande. Miller's List of North American Recent Mammals is followed as authority, and some of the forms that have been described since its publication have also been included. One notices that *Callospermophilus lateralis arizonensis*, inadvertently omitted from the Miller list, is also omitted here.

The reviewer is a little doubtful as to the practicability of positive identifications through the use of this book. No keys are given, and very few skull characters mentioned. This is explained, however, by the author: "Apart from making the book too technical, the inclusion of skull characters for every form would require a work of not one but several volumes. Upon rare occasions, when a species has been so dependent upon cranial characters that superficial characters were too obviously inadequate, it has become necessary to employ these internal data. Many lovers of mammals see their specimens in the flesh and a description of external features is what is wanted. The more technical reader is referred to the constantly cited revisions. For anyone wishing to go beyond the handbook stage in his study of mammals, these revisions are not only helpful but an absolute essential." The enormous task of assembling the descriptions, of necessity largely compilations, has been well done. Following the descriptive text on each group, one finds a well balanced, brief account of the habits of the mammal, largely a compilation but frequently with insertions of original observations. The arrangement of the text is good, and convenient to use.

Illustrations are profuse throughout the book. The halftones are excellent. The colored illustrations are well selected as to representation of mammals and add decidedly to the usefulness of the volume; but reproduction has not always been faultless, and some colors, particularly the grays, are not true to life. One dislikes to mention the text figures. They are messy and crude, and certainly can not be looked upon with pride by an author of such merit or a publisher of such recognized standing.

Anthony's handbook fills a long-felt need in mammalogical literature. It is the only book published today that treats of all North American mammals, with descriptions, ranges, and common names. It is a pioneer in its own class, that should go far toward promoting a popular interest in mammals.—HARTLEY H. T. JACKSON.

Finley, William and Irene. WILD ANIMAL PETS. New York: Charles Scribner's Sons. 8vo, pp. xiv + 311, pls. 47, unnumbered. Cloth, $3.00. April, 1928.

The writers of this entertaining volume are among those rare individuals who have the knack of attracting wild animals to them, gaining their confidence, and

becoming, as it were, part of them. They have the added ability of writing in such lucid style that their readers are carried along with them and feel the authors' own intimacy with their pets. Literature, light and interesting reading, rather than the deeper natural history, is the character of this book, although it contains many scattered bits of useful information. It treats of some twenty species of mammals, among which are included the black bear, mountain lion, bobcat, coyote, coati mundi, badger, skunk, ring-tailed cat, porcupine, and red squirrel. A really good book for the nature lover.—HARTLEY H. T. JACKSON.

ADAMS, L. A. Banana stowaways. Science, n. s., vol. 67, p. 218. February 24, 1928. (Five *Marmosa* found in a single bunch of bananas.)

AGAPI, C. Action de l'atropine sur quelques organes: modifications histologiques; diminution de la résistance au froid. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 1120–1122. October 21, 1927. (Experiments on white mice.)

AKELEY, MARY L. JOBE. In the land of his dreams. The last chapter of Carl Akeley's 1926 African expedition. Nat. Hist., vol. 27, pp. 525–532, illus. December, 1927 (March, 1928).

ALLEN, EDGAR. An unfertilized tubal ovum from *Macacus rhesus*. Anat. Rec., vol. 37, pp. 351–356. February 25, 1928.

ALLEN, GLOVER M. Porcupines from China. Amer. Mus. Novitates, no. 290, 4 pp. October 24, 1927. (New: *Acanthion subcristatus papae*.)

——— The walrus in New England. Bull. Boston Nat. Hist. Soc., no. 47, pp. 10–12, illus. April, 1928.

——— New Asiatic mammals. Amer. Mus. Novitates, no. 317, 5 pp. May 19, 1928. (New: *Crocidura lar*, *Rhinolophus blythi parcus*, *R. lanosus spurcus*, and *Coelops sinicus*.)

ANTHONY, H. E. With the "fuzzies" after ibex. Nat. Hist., vol. 27, pp. 601–614, illus. December, 1927 (March, 1928).

ARTHUR, STANLEY C. Report of the Division of Wild Life [Louisiana]. 8th Biennial Rep. Dept. Conservation State of Louisiana, 1926–1928, pp. 226–324, illus. May, 1928. (Discusses the subject of saving fur animals in flood time, and gives information on the take of fur animals in Louisiana.)

ASHBROOK, FRANK G., AND KARL B. HANSON. Breeding martens in captivity. Journ. Heredity, vol. 18, pp. 498–503, illus. November, 1927.

ATHIAS, M., AND J. FONTÉS. Influence de la pilocarpine sur les effets cardiaques de l'excitation du vague chez le chien. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 715–717. August 26, 1927.

BASCOM, K. F., AND H. L. OSTERUD. Quantitative studies of the testis. III. A numerical treatment of the development of the pig testis. Anat. Rec., vol. 37, pp. 63–82. November 25, 1927.

BEATTIE, J. The visceral lymphatic channels of the Catarrhinae. (Illustrated by the direction of the spread of tuberculosis.) Proc. Zool. Soc. London, 1927, pt. 2, pp. 459–470. July, 1927.

——— The anatomy of the common marmoset (Hapale jacchus Kuhl). Proc. Zool. Soc. London, 1927, pt. 3, pp. 593–718, illus. September, 1927.

BLACK, DAVIDSON. The lower molar hominid tooth from the Chou Kou Tien deposit. Palaeontologia Sinica, ser. D, vol. 7, fasc. 1, pp. 1–28, pls. 1–2. 1927. (New gen. and sp.: *Sinanthropus pekinensis*.)

BLAIR, FRANK D. "Vermin" control in game conservation. Fins, Feathers and Fur, no. 56, pp. 22, 24–25, 31, 33–34. February, 1928. (A prejudicial account. Another writer misunderstands the "balance of nature." Amateurs have so toyed with this term that professional ecologists might well coin a new word to represent its true ecological meaning.)

BOIVIN, ANDRE. Insuline et cancer expérimental du lapin. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 809–811. August 26, 1927.

BOLKAY, ST. J. Further contributions to the mammalian fauna of the Balkan Peninsula. Glasnik Zemaljskog Muzeja u Bosni i Hercegovini, vol. 39, pp. 43–52, illus. 1927. (Partly in German. Notes on six species, somewhat detailed on *Dolomys marakovici*.)

——— On some remarkable mammalian remains from North Bosnian prähistoric settlements. Novitates Musei Sarajevoensis, no. 5, pp. 1–3, pls. 1–2. December 31, 1927. (New: *Cervus elaphus neolithicus;* records also mandible of *Sus scrofa reiseri*.)

BRYANT, HAROLD C. A timely nature lesson. Yosemite Nature Notes, vol. 6, pp. 44–45. June, 1927. (New-born fawns should be left undisturbed.)

——— A nature preserve for Yosemite. Yosemite Nature Notes, vol. 6, pp. 46–48. June, 1927.

——— Chickarees eat stems of black oak leaves. Yosemite Nature Notes, vol. 6, p. 62. August, 1927.

——— How long will a bear stay up a tree? Yosemite Nature Notes, vol. 6, p. 86. November, 1927.

——— Flying squirrels in Yosemite camps. Yosemite Nature Notes, vol. 6, p. 87. November, 1927.

BURNET, E. La toxine streptococcique chez le lapin. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 688–689. August 26, 1927.

BURTON, R. G. Wild animals and fire. Field [London], vol. 151, p. 338. February 23, 1928. (Predaceous carnivores not kept off by fires.)

BUTCHER, EARL O. The origin of the definitive ova in the white rat (Mus norvegicus albinus). Anat. Rec., vol. 37, pp. 13–29, illus. November 25, 1927.

CARNOT, PAUL AND MARGUERITE. Les cytopoïétines foetales (tréphones) au cours de la gestation. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 694–696. August 26, 1927. (Experiments on rabbits.)

CATTELL, J. MCKEEN AND JAQUES. American men of science. 4th ed. Pp. viii + 1129. New York: The Science Press. Cloth, $10.00. November, 1927.

CHAPMAN, ABEL. The Rhodesian cheetah. Field [London], vol. 151, p. 654. April 19, 1928. (Considers this form merely individual color variation.)

CHASEN, F. N., AND C. BODEN KLOSS. Mammals of Pulan Berhala. Miscellanea Zoologica Sumatrana [Medan, Sumatra], no. 27, p. 1–2. 1928. (Lists four species.)

——— Spolia mentawiensia. With an introduction by C. Boden Kloss. Proc. Zool. Soc. London, 1927, pt. 4, pp. 797–840, 5 col. pls., 1 map. January 12, 1928. (New: *Pithecus potenziani siberu, Simias concolor siberu, Para-*

doxurus hermaphroditus siberu, Hemigalea derbyana sipora, Cervus unicolor oceanus, Iomys horsfieldi sipora, Sciurus melanogaster mentawi, S. lowii siberu, Lariscus niobe siberu, Rattus rattus mentawi, Tupaia glis siberu, and *Macroglossus minimus fraternus.*)

CLAPHAM, R. Animal tracks in snow. Field [London], vol. 151, p. 390, illus. March 8, 1928.

CLARKE, W. J. Grampus at Scarborough. Field [London], vol. 151, p. 763, illus. May 3, 1928. (Young *Orcinus orca*, 8 feet 11 inches in length, washed ashore.)

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CORNWALL, IRA E. Collecting at Cachalot Whaling Station. Canadian Field-Nat., vol. 42, pp. 9–12. February 20, 1928. (Vancouver Island.)

DA CUNHA, ARISTIDES MARQUES, AND JULIO MUNIZ. Ciliés du genre Balantidium, parasites des singes. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 823–825. August 26, 1927.

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DAHL, KNUT. Rovvildtet i vor jagthusholdning. Norsk Jaeger og Fisker-Forening Tidsskrifts, heft 6, pp. 1–9 (of reprint), 1 folding chart. 1927. (A discussion of the causes of periodic increase and decrease of animals in Norway.)

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DEMOOR, J., AND P. RYLANT. A propos de l'intervention des "substances actives" et des "substances vagales" dans le travail du coeur. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 726–729. August 26, 1927. (Experiments on the cat.)

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DÉVÉ, F., AND P. ROLLAND. Echinococcose expérimentale du tibia. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 1132–1133. October 28, 1927. (Experiments on rabbits.)

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EASTMAN, GEORGE. A safari in Africa. Nat. Hist., vol. 27, pp. 533–538, illus. December, 1927 (March, 1928).

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ÉHIK, J. Újabb adatok magyarország emlösfaunájának ismeretéhez. [Recent additions to the Hungarian mammal fauna.] Allattani Közlemenyek, vol. 25, nos. 1–2, pp. 54–57, 98–99. April, 1928. (Summary in German, pp. 98–99. New: *Sorex araneus csikii*.)

ELTON, CHARLES. Animal ecology. xxi + 207 pp., 8 pls. London: Sidgwick and Jackson, Ltd. 1927.

ENGLE, EARL T., AND JOHN ROSASCO. The age of the albino mouse at normal sexual maturity. Anat. Rec., vol. 36, pp. 383–388. October 25, 1927.

ESTERMAN, BENJAMIN, AND ABRAHAM J. GITLITZ. Notes on the golgi apparatus in spinal-ganglion cells of the cat. Anat. Rec., vol. 36, pp. 319–324, illus. October 25, 1927.

FORTUYN, AEMILIUS BERNARDUS DROEGLEEVER. Histological experiments with the brain of some rodents. Journ. Comp. Neurol., pp. 349–391, illus. February 15, 1927. (Effect of various agents on the cortical nerve cells of *Cricetulus griseus*.)

——— Notes on the striped hamster (Cricetulus griseus, Thomas). China Medical Journ., vol. 41, pp. 1–5 (of reprint). October, 1927.

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GIDLEY, J. W. Continuing the elephant hunt. Explorations and field-work of the Smithsonian Institution in 1927, Smithsonian Inst., publ. 2957, pp. 11–16, illus. 1928. (Fossil collecting in Florida.)

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GRAY, S. W. E. Hair ball from a lion's gullet. Field [London], vol. 151, p. 225, illus. February 9, 1928.

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——— A new race of black bear from Vancouver Island, British Columbia, with remarks on other northwest coast forms of Euarctos. Univ. California Publ. Zool., vol. 30, no. 10, pp. 231–242, pls. 12–13. March 2, 1928. (New: *Ursus americanus vancouveri*.)

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HEYMANS, C., AND JEAN DALSACE. Les réactions anaphylactiques de la tête "isolée" du chien. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 741–743. August 26, 1927.

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——— Zwei Radien von Felis spelaea Goldf. aus der Mark. Zeitsch. f. Geschiebeforschung, vol. 3, nos. 1–2, pp. 79–81. 1927.

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HUBBACK, THEODORE R., AND D. MACGREGOR. The way seladang fight. Field [London], vol. 151, p. 829, illus. May 17, 1928.

HUXLEY, JULIAN. Mice and men. Harper's Mag., December, 1927, pp. 42–50. 1927. (An extremely interesting discussion of the apparent correlation between periodic fluctuations in the numbers of various animals and the 11-year cycle of sun-spot numbers.)

JENSEN, A. S. The fauna of Greenland. Greenland, vol. 1, pp. 319–355, illus. 1928. (Notes on 30 species of mammals.)

JENSEN, J. P. Another viewpoint on "vermin." Fins, Feathers and Fur, no. 56, pp. 23, 26, 35. February, 1928. (A sane article on the question.)

JOHNSON, MARTIN. Picturing Africa. Nat. Hist., vol. 27, pp. 539–560, illus. December, 1927 (March, 1928).

JOHNSON, OSA. "At home" in Africa. Nat. Hist., vol. 27, pp. 561–569, illus. December, 1927 (March, 1928). (Notes on mammals.)

JORDAN, KARL. Siphonaptera collected during a visit to the eastern United States of North America in 1927. Novitates Zoologicae, vol 34, pp. 178–188, illus. February, 1928. (Sixteen species from 21 species of mammals.)

KEITH, ARTHUR. Cranial characteristics of gorillas and chimpanzees. Nature, no. 3034, vol. 120, pp. 914–915. December 24, 1927.

KELLOGG, REMINGTON. The history of whales—Their adaptation to life in the water. Quart. Rev. Biol., vol. 3, pp. 29–76, illus.; pp. 174–208, illus. March and June, 1928.

KINDER, ELAINE FLITNER. A study of the nest-building activity of the albino rat. Journ. Exper. Zool., vol. 47, pp. 117–161, illus. April 5, 1927.

KIRKLAND, RUTH H. My acquaintance with picket pins. Yosemite Nature Notes, vol. 6, p. 68, illus. September, 1927. (Brief notes on Belding ground-squirrel.)

KLOSS, C. BODEN. The one-horned rhinoceros in the Malay Peninsula. Journ. Federated Malay States Museums, vol. 13, pt. 4, pp. 207–208, pl. 5. August, 1927.

KRAMER, HERBERT. Sorex alpinus hercynicus Mell. in der preussischen Oberlausitz. Zool. Anzeiger, vol. 73, p. 244, 1 fig. September 20, 1927.

LANE, H. H. A new rhinoceros from Kansas. Univ. Kansas Sci. Bull., vol. 17, no. 2, pp. 297–311, illus. September, 1927. (New gen. and sp.: *Paraphelops rooksensis*.)

——— A new protypothere from the Santa Cruz formation of Patagonia. Univ. Kansas Sci. Bull., vol. 17, no. 3, pp. 313–317, illus. September, 1927. (New: *Protypotherium martini*.)

LAVAUDEN, LOUIS. Notes de mammalogie Nord-Africaine, le zorille. Bull. Soc. Zool. de France, vol. 99, pp. 630–634. 1924.

——— Les vertébrés du Sahara. Pp. 200, illus. Librairie Tournier, Tunis, France. 1926. (Notes on the mammals and list of species, pp. 30–77.)

——— Voyage d'un ornithologiste a travers l'Afrique. (Title on cover of separates given as "Voyage, d'un naturaliste a travers d'Afrique.) Rev. Française d'Ornithol., ser. 2, 18th year, nos. 208–210, pp. 311–356, illus.; no. 211, pp. 428–439, map; no. 212, pp. 484–509, illus. 1926. (The first part contains many notes on mammals.)

LAWRENTJEW, A. P. Zur Lehre von der Innervation des Lymphsystems. I Mitteilung: Über die Nerven des Ductus thoracicus beim Hunde. Anat. Anzeiger, vol. 60, pp. 475–481, illus. February 1, 1926.

LEIGH, W. R. Painting the backgrounds for the African hall groups. Nat. Hist., vol. 27, pp. 575–582, illus. December, 1927 (March, 1928).

LEOPOLD, ALDO. Pineries and deer on the Gila. New Mexico Conservationist, vol. 1, no. 3, p. 3. March, 1928.

LIMA, A. DA COSTA. Coléoptères Siaphylinidae, rencontrés dans les poils de muridés. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 842–843. August 26, 1927.

LITTLE, C. C. Opportunities for research in mammalian genetics. Sigma Xi Quart., vol. 16, no. 1, pp. 16–35. March, 1928.

LONGMAN, HEBER A. New records of Cetacea, with a list of Queensland species. Mem. Queensland Mus., vol. 8, pt. 3, pp. 266–278, 1 pl. March 31, 1926. (New: *Mesoplodon pacificus*.)

LUCAS, N. S., AND E. MARGARET HUME. On the breeding of the common marmoset (Hapale jacchus Linn.) in captivity when irradiated with ultra-violet rays. Proc. Zool. Soc. London, 1927, pt. 2, pp. 447–451, 2 pls. July, 1927.

MA, WEN-CHAO, R. K. S. LIM, AND AN-CH'ANG LIU. Changes in the golgi apparatus of the gastric gland cells in relation to activity. Chinese Journ. Physiol., vol. 1, pp. 305–330, illus. 1927. (Experiments on dogs and rabbits.)

MATSCHIE, PAUL. Diagnosen einiger Säugetiere aus dem Kongostaat. Zeitsch. f. Säugetierkunde, vol. 1, no. 2, pp. 110–114. December 24, 1926. (New: *Nasilio luluae, Crocidura luluae, Lemniscomys luluae,* and *Pelomys luluae.*)

MCDONALD, C. H. A tale of a woodchuck. Amer. Forests and Forest Life, vol. 34, pp. 46–47, illus. January, 1928.

MICHAÏL, D., AND P. VANCEA. Action de l'extrait de glandes lacrymales sur la pression sanguine. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 1101–1104, 3 figs. October 21, 1927. (Experiments on rabbits.)

MIGULIN, A. A. The spermophiles found in Ukraine [trans. title]. Travaux de la Soc. de Naturalistes de Charkov, vol. 50, pt. 2, pp. 1–6 (of reprint). 1927. (In Russian. New: *Citellus suslicus averini* and *C. s. meridio-occidentalis.*)

——— Mice of northeastern Ukraine [trans. title]. Travaux de la Soc. de Naturalistes de Charkov, vol. 50, pt. 2, pp. 1–31 (of reprint). 1927. (In Russian. Lists 13 species. New: *Apodemus agrarius nikolskii.*)

MILLER, GERRIT S., JR. A new bat of the genus Coelops. Proc. Biol. Soc. Washington, vol. 41, pp. 85–86. March 16, 1928. (New: *C. inflata.*)

MILLER, GERRITT S., JR., AND GLOVER M. ALLEN. The American bats of the genera Myotis and Pizonyx. U. S. Nat. Mus. bull. 144, pp. viii + 218, pl. 1. May 25, 1928. (A complete taxonomic revision of these genera, in which 47 forms are discussed of which the following are new: *M. lucifugus phasma, M. l. fortidens, M. yumanensis lutosus, M. thysanodes aztecus, M. sodalis, M. nigricans extremus,* and *M. chiloensis alter.*)

MOHR, ERNA. Biologische Beobachtungen an gefangenen Feldmäusen. (Microtus arvalis Pall.) Schriften Naturwissensch. Vereins. f. Schleswig-Holstein, vol. 18, no. 1, pp. 40–48. 1927.

MONTANÉ, L. Histoire d'une famille de chimpanzés. Pp. 1–21, pls. 1–4 (not original). [Probably a reprint from Bull. et Mém. Soc. Anthrop.] Paris. 1928. (Contains account of birth of a young chimpanzee and eating of placenta by the mother.)

MORAN, P. J. Big horn sheep. Canadian Field-Nat., vol. 42, pp. 12–17, illus. February 20, 1928.

MORI, TAMEZO. On three new mammals from Manchuria. Annotationes Zoologicae Japonenses, vol. 2, no. 2, pp. 107–109. July 31, 1927. (New: *Petaurista watasei, Myospalax komurai,* and *Hemiechinus manchuricus.*)

MORRISON, M. Elephants asleep. Field [London], vol. 151, p. 344. March 1, 1928.

MOTLEY, W. C. Rangifer caribou and its subspecies. Rod and Gun [Woodstock, Ontario], vol. 29, pp. 967–968. May, 1928.

MURISIER, P. Une genette dans le canton de Vaud. Bull. de la Soc. Vaudoise des Sci. Nat., vol. 56, no. 219, pp. 329–331, 1 fig. July 25, 1927.

MURPHY, ROBERT CUSHMAN. Antarctic zoogeography and some of its problems. Amer. Geog. Soc. special publ. no. 7, pp. 355–379. 1928.

NICKALLS, VIVIAN. The breeding of badgers. Field [London], vol. 151, p. 829. May 17, 1928. (European badger in captivity gives birth to four young.)

OGNEV, S. I. A remarkable small mammal [trans. title]. Nature and Sport in Ukraine [Kharkov], 1924, nos. 1–2, pp. 1–2 (of reprint). 1924. (In Russian. New gen. and sp.: *Myomimus personatus*.)

——— The bears occurring in Russia [trans. title]. Nature and Sport in Ukraine [Kharkov], 1924, nos. 1–2, pp. 1–8 (of reprint). 1924. (In Russian. New: *Ursus arctos jeniseensis*, *U. a. baikalensis*, *U. a. kolymensis*, *U. pamirensis*, and *U. yesoensis*.)

——— Rodentia of the North Caucasus. Pp. 1–61. Rostov-on-Don. 1924. (In Russian. New: *Alactaga jaculus fuscus*, *Cricetulus migratorius pulcher*, *Microtus arvalis macrocranius*, *M. a. rossiae-meridionalis*, *M. brevirostris*, *Arbusticola rubellianus ciscaucasicus*, *Chionomys personatus*, *Apodemus agrarius septentrionalis*, *Sylvaemus sylvaticus fulvipectus*, and *S. s. ciscaucasicus*.)

ORLOFF, PRINCE. A white wild rabbit. Field [London], vol. 151, p. 654. April 19, 1928. (White rabbit with blue eyes shot in France.)

OSBORN, HENRY FAIRFIELD. Additional new genera and species of the mastodontoid Proboscidea. Amer. Mus. Novitates, no. 238, 16 pp., illus. November 30, 1927. (New genera: *Pliomastodon*, genotype *Mastodon matthewi*; *Turicius*, genotype *Mastodon turicensis*; and *Cordillerion*, genotype *Mastodon andium*. New forms: *Mastodon americanus plicatus*, *Zygolophodon pyrenaicus aurelianensis*, *Turicius turicensis simarrensis*, *Serridentinus browni*, *S. republicanus*, *S. obliquidens*, *S. anguirivalis*, *S. brewsterensis*, *S. guatemalensis*, *Rhynchotherium anguirivalis*, and *Anancus falconeri*.)

——— The vanishing wild life of Africa. Nat. Hist., vol. 27, pp. 515–524, illus. December, 1927 (March, 1928).

OSLUND, R. M. Seasonal modifications in testes of vertebrates. Quart. Rev. Biol., vol. 3, pp. 255–270. June, 1928.

PACK, ELEANOR B. Camera hunting on the continental divide. Nature Mag., vol. 11, pp. 149–152, illus. March, 1928. (Beavers.)

PAINTER, THEOPHILUS S. The chromosome constitution of the Little and Bagg abnormal eyed mice. Amer. Nat., vol. 62, pp. 284–286. May, 1928.

PALMER, T. S. An earlier name for the genus Evotomys. Proc. Biol. Soc. Washington, vol. 41, p. 87. March 16, 1928. (Designates *Mus rutilus* Pallas as type of the genus *Clethrionomys* Tilesius, 1850.)

PARHON, C. I., M. CAHANE, AND V. MARZA. Action des lipoides placentaires sur la teneur en eau du sang, du tissu musculaire et de quelques organes. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 1112–1114. October 21, 1927. (Experiments on guinea-pigs.)

PASSEMARD, E. Quelques observations sur les chimpanzés. Journ. Psych. normale et pathologique [Paris], vol. 24, pp. 243–253. May 15, 1927. (Psychological observations on some of the Abreu chimpanzees.)

PEARL, RAYMOND. Evolution and mortality. Quart. Rev. Biol., vol. 3, pp. 271–280. June, 1928. (Based on autopsy records made in zoological gardens.)

PIRES DE LIMA, J. A. "Queue de cochon" chez une enfant. Bull et Mém. Soc. Anthrop, Paris, ser. 7, vol. 8, pp. 58–60, figs. 1–2, from photographs. 1927. (Tail 51 mm. long, 10 mm. in diameter at base; no vertebrae.)

POCOCK, R. I. The external characters of a bush-dog (Speothos venaticus) and of a maned wolf (Chrysocyon brachyurus), exhibited in the society's gardens. Proc. Zool. Soc. London, 1927, pt. 2, pp. 307–321, illus. July 12, 1927.

——— The gibbons of the genus Hylobates. Proc. Zool. Soc. London, 1927, pt. 3, pp. 719–741, illus. September, 1927.

——— [A remarkable variety of leopard.] Proc. Zool. Soc. London, 1927, pt. 3, pp. 791–795, illus. September, 1927. (Exhibition of skin from southern part of the province of Kanara, south India.)

——— A family of orang-utans. Field [London], vol. 151, p. 244, illus. February 9, 1928.

——— The Sumatran rhinoceros. Field [London], vol. 151, p. 338, illus. February 23, 1928. (Newly born young received by British Museum of Natural History.)

——— The Siamang gibbon. Field [London], vol. 151, p. 344, illus. March 1, 1928.

——— The Rhodesian cheetah. Field [London], vol. 151, p. 593, illus. April 5, 1928.

POHLE, HERMANN. Paul Matschies Schriften. Zeitsch. f. Säugetierkunde, vol. 1, no. 2, pp. 90–110. December 24, 1926. (Lists 325 titles, many of them dealing with mammals.)

PREBLE, EDWARD A. Our disappearing fur bearers. Nature Mag., vol. 10, pp. 375–381, illus. December, 1927. Reprinted as booklet, 24 pp., 1928.

PRICE, EMMETT W. New helminth parasites from Central American mammals. Proc. U. S. Nat. Mus., vol. 73, art. 4, pp. 1–7, pls. 1–2. 1928.

REDEKE, H. C. Ein Walross in der südlichen Nordsee. Zool. Anzeiger, vol. 74, pp. 89–90; 1 fig. October 20, 1927.

REMANE, ADOLF. Eine seltsame Gebissanomalie bei einem Stummelaffen. Zeitsch. f. Säugetierkunde, vol. 1, no. 2, pp. 114–120, illus. December 24, 1926.

RIVETT, A. C. D. The flying fox pest in Australia. Nature, no. 3014, vol. 120, p. 189–190. August 6, 1927.

ROBINSON, G. C. Elephants asleep. Field [London], vol. 151, p. 806. May 10, 1928.

ROBINSON, H. C., AND C. BODEN KLOSS. A new rat from the mountains of East Java. Journ. Federated Malay States Museums, vol. 13, pt. 4, p. 209. August, 1927. (New: *Rattus concolor equile.*)

ROBINSON, H. W. The size of otters. Field [London], vol. 151, p. 614. April 12, 1928.

ROCKWELL, ROBERT H. Collecting large mammals for museum exhibition. Nat. Hist., vol. 27, pp. 583–587, illus. December, 1927 (March, 1928).

ROSKAM, JACQUES. Une particularité curieuse de la rétraction de certains caillots sans plaquettes. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 730–731. August 26, 1927. (Experiments on rabbits.)

RUSSELL, C. P. A native mouser. Yosemite Nature Notes, vol. 7, pp. 6–7. January, 1928. (Notes on *Bassariscus.*)

SALVESEN, SIGVALD. Pelsdyrboken. Håndbok i opdrett av pelsdyr. 12mo, paper, 144 pp., illus. Oslo: J. W. Cappelens Forlag. April, 1928. (An attractive book full of information on raising fur-bearers. Particular detail is devoted to the silver fox; other species discussed are the arctic fox, raccoon, marten, otter, skunk, squirrel, beaver, muskrat, karakul sheep, and chinchilla rabbit.)

SAWYER, EDMUND J. Yellowstone Nature Notes. Parks and Recreation, vol. 11, pp. 215–220, illus. January-February, 1928. (Notes on mammals.)

SCHEPPEGRELL, WILLIAM. Model out-of-doors lion house in Audubon Park. Parks and Recreation, vol. 11, pp. 202–203, illus. February, 1928.

SCHWARTZ, BENJAMIN. Two new nematodes of the family Strongylidae, parasitic in the intestines of mammals. Proc. U. S. Nat. Mus., vol. 73, art. 2, pp. 1–5, pls. 1–2. 1928.

SCOTT, H. HAROLD. Neoplasm in an Indian rhinoceros (sarcoma of heart and lungs). Proc. Zool. Soc. London, 1927, pt. 3, pp. 503–510, 2 pls. September, 1927.

——— Two cases of peritoneal neoplasm (endothelioma). Proc. Zool. Soc. London, 1927, pt. 3, pp. 511–518, 6 pls. September, 1927. (Cases in brindled gnu, *Gorgon taurinus*, and hamster, *Cricetus frumentarius*.)

SCOVILLE, SAMUEL, JR. Lords of the wild. 246 pp., 4 pls. New York: William Morrow and Company. 1928. (Stories of mammals and other creatures.)

SEFVE, IVAR. Die Hipparionen Nord-Chinas. Palaeontologia Sinica, ser. C, vol. 4, fasc. 2, pp. 1–93, pls. 1–7. February, 1927. (New gen. and sp.: *Proboscidipparion sinense*. New sp.: *Hipparion hippidiodus*, *H. dermatorhinum*, *H. plocodus*, *H. fossatum*, *H. coelophyes*, *H. kreugeri*, *H. platyodus*, *H. parvum*, *H. ptychodus*, and *H. tylodus*.)

SHAMEL, H. HAROLD. A new bat from Dominica. Proc. Biol. Soc. Washington, vol. 41, pp. 67–68. March 16, 1928. (New: *Natalus dominicensis*.)

SHARP, DALLAS LORE. A Wasatch grizzly. Nature Mag., vol. 11, pp. 162–165, illus. March, 1928.

SHOEMAKER, D. A. The Pecos elk range. New Mexico Conservationist, vol. 1, no. 3, pp. 11–12. March, 1928.

SILVER, JAMES. Woodchuck control in the eastern states. U. S. Dept. Agric., Leaflet no. 21, 6 pp., illus. March, 1928.

SIMPSON, GEORGE GAYLORD. Mammalian fauna of the Hell Creek formation of Montana. Amer. Mus. Novitates, no. 267, 7 pp., illus. April 30, 1927. (New gen. and sp.: *Essonodon browni* and *Gypsonictops hypoconus*. New sp.: *Meniscoëssus borealis* and *Ectoconodon montanensis*.)

——— Mammalian fauna and correlation of the Paskapoo formation of Alberta. Amer. Mus. Novitates, no. 268, 10 pp., illus. April 30, 1927. (New gen. and sp.: *Propalaeosinopa albertensis* and *Elpidophorus elegans*.)

——— A new mammalian fauna from the Fort Union of southern Montana. Amer. Mus. Novitates, no. 297, 15 pp., illus. February 2, 1928. (New fam.: Nyctitheriidae. New gen. and sp.: *Protentomodon ursirivalis*, *Leipsanolestes siegfriedti*, *Carpolestes nigridens*, and *Planetetherium mirabile*. New sp.: *Thryptacodon pseudarctos*.)

SORGE, F. Über den atavistischen Processus supra condyloideus humeri. Anat. Anzeiger, vol. 60, pp. 467–474, illus. February 1, 1926. (Gives long list of mammals showing this process.)

STEVENSON, PAUL H. Anthropometry in China: An extended outline of research. China Medical Journ., vol. 40, no. 2, pp. 1–33 (of reprint). February, 1926. (Of possible value to mammalogists for methods.)

STEVENSON-HAMILTON, J. The Kruger National Park. Illustrated London News, vol. 171, no. 4616, pp. vi–vii, 630, illus. October 8, 1927. (General account of the park which contains some 8,000 square miles, and is used as a wild-life preserve. "Nature's check on the undue increase of any species by the elimination of the less fit is provided by the presence of carnivorous animals—lions, leopards, cheetahs, African hunting dogs." It has been calculated that for the more fertile portions, approximately 34, and for the barren areas 6, of the larger herbivorous animals exist to the square mile.)

STILES, C. W. What constitutes publication? Science, n. s., vol. 67, pp. 471–478. May 11, 1928.

SUMNER, F. B. Colorimetric methods in biology. Science, n. s., vol. 67, p. 271. March 9, 1928.

——— Observations on the inheritance of a multifactor color variation in white-footed mice (Peromyscus). Amer. Nat., vol. 62, pp. 193–206, illus. May, 1928.

TAIT, JOHN. Homology, analogy and plasis. Quart. Rev. Biol., vol. 3, pp. 151–173. June, 1928.

TAVERNER, P. A. Bears and hawks. Condor, vol. 30, p. 157. March, 1928.

THOMAS, OLDFIELD. On further monkeys of the Callicebus torquatus group. Ann. and Mag. Nat. Hist., ser. 9, vol. 20, p. 287. September, 1927. (New: *C. t. ignitus*.)

——— On Bornean specimens of the teledu (Mydaus). Ann. and Mag. Nat. Hist., ser. 9, vol. 20, p. 288. September, 1927. (Considers *M. montanus* and *M. luciferoides* as synonyms of *M. lucifer*, which is distinguishable from *M. javanensis*.)

——— The Godman-Thomas Expedition to Peru.—VI. On mammals from the Upper Huallaga and neighboring highlands. Ann. and Mag. Nat. Hist., ser. 9, vol. 20, pp. 594–608. December, 1927. (New: *Rhipidomys rex*, *Thomasomys fraternus*, *Cavia tschudii festina*, and *Marmosa leucastra*.)

——— A new genus and species of glossophagine bat, with a subdivision of the genus Choeronycteris. Ann. and Mag. Nat. Hist., ser. 10, vol. 1, pp. 120–123. January, 1928. (New gen. and sp.: *Platalina genovensium*. New gen.: *Choeroniscus*, genotype *Choeronycteris minor*.)

——— A new Thomasomys from Rio Grande do Sul. Ann. and Mag. Nat. Hist., ser. 10, vol. 1, pp. 154–155. January, 1928. (New: *T. oenax*.)

TUROV, S. Versuch einer systematischen Ubersicht der Säugetiere von Ossetien (Nordkaukasus). Bull. Scientifique de l'Institut de l'Exploration Regional du Caucase du Nord, vol. 1, pp. 311–337. 1926. (In Russian; summary in German. New: *Arvicola terrestris ognevi*.)

VALCK, B. S. A new species of mouse [trans. title]. Travaux de la Soc. de Naturalistes de Charkov, vol. 50, pt. 2. 1927. (In Russian. Not seen. New: *Mus sergii*, from Ukraine.)

VAN GELDEREN, CHR. Zur vergleichenden Anatomie der Vv. cardinales posteriores, der V. cava inferior und der Vv. azygos (vertebrates). Anat. Anzeiger, vol. 63, pp. 49–72, 4 figs. April 21, 1927. (Much on mammals.)

VERNAY, ARTHUR S. Angola as a game country. Nat. Hist., vol. 27, pp. 588–594, illus. December, 1927 (March, 1928).

VINAL, WILLIAM G. The camp as a wild life sanctuary. Nature Mag., vol. 11, pp. 174–176, illus. March, 1928.

VINOGRADOV, B. Notes on some gerboas from Mongolia. Comptes Rendus de l'Acad. Sci. Union Socialistic Soviet Republics, 1926, pp. 232–234. 1927. (New: *Alactagulus acontion potanini*.)

——— Materials for the systematics and the morphology of rodents. IV. On the mechanism of gnawing and mastication in some fossorial rodents. Annuaire du Musée Zool. de l'Acad. Sci. Union Socialistic Soviet Republics, vol. 27, 1926, pp. 275–282, pls, 18–20. 1927.

——— Notes sur les mammifères de la Iakoutie. I. Arvicoles lemmingoides (genre Aschizomys). Matériaux de la Commission pour l'Étude de la République Autonome Soviétique Socialiste Iakoute, livr. 17, pp. 19, illus. Publ. by Acad. Sci. Union Socialistic Soviet Republics. 1927. (Title in French and Russian. Text in Russian, with summary in English. Examines four specimens of the rare *Aschizomys* and concludes it is a recognizable genus.)

——— Notes sur les mammifères de la Iakoutie. II. Arvicoles rousses (genre Evotomys). Matériaux de la Commission pour l'Étude de la République Autonome Soviétique Socialiste Iakoute, livr. 18, pp. 20, pls, 3. Publ. by Acad. Sci. Union Socialistic Soviet Republics. 1927. (Title in French and Russian. Text in Russian, with summary in English. New: *Evotomys rutilus jacutensis*.)

——— Über eine neue Springmaus (Scirtopoda lichtensteini sp. n.) aus der Karakum—Wüste, Russisch-Turkestan. Zeitsch. f. Säugetierkunde, vol. 2, pp. 92–101, illus. October 15, 1927.

VIRCHOW, HANS. Mechanic der Tigerzehen. Zeitsch. f. Säugetierkunde, vol. 1, nos. 1–2, pp. 64–90, 8 figs., pls. 3–4. August 31 and December 24, 1926.

WAGNER, GEORGE. Banana stowaways. Science, n. s., vol. 67, p. 422. April 20, 1928. (*Marmosa*, probably *M. murina*, carried a litter of young on her back.)

WARDEN, C. J., AND L. H. WARNER. The sensory capacities and intelligence of dogs, with a report on the ability of the noted dog "Fellow" to respond to verbal stimuli. Quart. Rev. Biol., vol. 3, no. 1, pp. 1–28, frontis. March, 1928.

WARREN, EDWARD R. Banana stowaways. Science, n. s., vol. 67, p. 422. April 20, 1928. (Records a specimen each of *Marmosa cinerea* and *Marmosa zelodoni*.)

WEAVER, H. O. The deer herd of Washington County, Iowa. Amer. Field, vol. 119, no. 9, p. 204, illus. March 3, 1928. (Notes on distribution. Live deer with locked antlers found.)

WHITAKER, J. White wild rabbits. Field [London], vol. 151, p. 763. May 3, 1928.

WILLHOFT, WALDO. Coyotes via airplane and round-up. Novel methods of hunting the marauder of the plains. Forest and Stream, vol. 98, pp. 338–339, 370–372, illus. June, 1928.

WOODS, E. G. Otters killing swans. Field [London], vol. 151, p. 806. May 10, 1928.

WRIGHT, GEORGE M. The "rhino buck" of Yosemite. Yosemite Nature Notes, vol. 7, p. 5, illus. January, 1928. (Three-antlered deer.)

——— House movers in "woodrat row." Yosemite Nature Notes, vol. 7, pp. 12–14, illus. February, 1928. (Notes on wood-rat house construction.)

——— Exit "Old Horny." Yosemite Nature Notes, vol. 7, pp. 17–18, illus. March, 1928. (Notes on three-antlered deer.)

YEAGER, DORR C. Ground squirrel's back scratcher. Yosemite Nature Notes, vol. 6, p. 64. August, 1927.

ZSCHOKKE, F. Die Faunenmischung am Südrand der Alpen. Verhandl. der Naturforsch. Gesellschaft in Basel, vol. 38, pp. 12–28. 1927.

ZUNZ, EDGARD, AND JEAN LA BARRE. Démonstration in vivo des propriétés cardio-modératrices du liquide provenant d'un coeur perfusé in vitro pendant l'excitation du vague. Comptes Rendus des Séances de la Soc. de Biol., vol. 97, pp. 721–724. August 26, 1927. (Experiments on the cat.)

COMMENT AND NEWS

Our corresponding secretary, A. Brazier Howell, has been appointed lecturer in comparative anatomy at the Johns Hopkins Medical School and will assume his new duties September 1. Members will please note that after that date all correspondence intended for him should be addressed A. Brazier Howell, Department of Anatomy, Johns Hopkins Medical School, Baltimore, Maryland. Mr. Howell will be away on vacation during August, and his correspondence during that time will remain unanswered until his return.

On the recommendation of the minister of marine and fisheries, the governor general of Canada in council, under date of June 20, 1928 established the following regulation for the protection of the walrus: No one shall hunt or kill any walruses in Hudson Bay or Strait or in Canadian Arctic waters south of the 74th parallel of north latitude; provided this prohibition shall not apply to the hunting and killing of walruses by natives on their own volition, and for their own food and clothing requirements, or to the taking of walruses for scientific purposes under a permit from the minister.

A survey of American game resources, undertaken by the Sporting Arms and Ammunition Manufacturers' Institute, began July 1. The purpose of the survey is to collect the experience and ideas of sportsmen and other conservation agencies as to the best ways and means for inducing the sustained production of game crops. Aldo Leopold, formerly of the U. S. Forest Service, has been engaged by the institute to conduct the survey. He is a graduate of the Yale Forestry School and has had a wide experience in the administration of outdoor resources and in conservation research.

The column on conservation and wild life in the May–June, 1928, issue of *Parks and Recreation* (vol. 9, no. 5, p. 362) is headed with a quotation from James Oliver Curwood that reads, in part: "It is the great law of existence that Life must destroy in order to live, and when the destruction is inevitable and necessary, it ceases to be a misdemeanor. . . . ." Then, as if the quotation were offered as an excuse, follows an article entitled "Relationship of predatory mammals and birds of prey to rodent life," from all appearances written by the conductor of the column but actually cribbed directly and verbatim (except for a typographical error) from the JOURNAL OF MAMMALOGY (vol. 9, pp. 73–74, February, 1928). No credit is given the author, Leo K. Couch; nor the institution with which he is associated, the U. S. Biological Survey; nor the JOURNAL OF MAMMALOGY. The JOURNAL OF MAMMALOGY has always been ready and willing to coöperate with any worthy organization or publication. We feel, however, that the minimum of courtesy and propriety requires recognition and credit when it is due. To that extent, at least, we intend to stand by our contributors.

The Museums Building of the University of Michigan was dedicated on June 14 with appropriate exercises. Dr. Thomas Barbour, director of the Museum of Comparative Zoology, was the principal speaker. The building houses the Museum of Zoology, Museum of Paleontology, Museum of Anthropology, and the University Herbarium. The north wing is 298 feet long, 65 feet wide, and five stories high, and is given over to study collections and research rooms. The south wing, 238 feet long by 65 feet wide, has one floor devoted to study collections, and three floors given over to biological demonstrations and exhibits. The Division of Mammals together with the Division of Birds occupies the third floor of the north wing. In the mammal section are rooms equipped for the storage of small mammal skins and skulls, tanned skins, large skulls and skeletons, and alcoholic specimens. There is a divisional library, a preparation room, and offices and research rooms. Two rooms are arranged for keeping small mammals alive for study and experimentation.

Dr. John Smith Dexter, a charter member of the American Society of Mammalogists, died April 19, 1928. Doctor Dexter was born at Shiocton, Wisconsin, August 21, 1885. He graduated from Ripon College in that state in 1908, received his master's degree from the University of Wisconsin the following year, and his doctorate from Columbia University in 1914. At the time of his death, he was professor of zoology in the University of Porto Rico.